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OBSERVATIONS ON THE CULTIVATION AND DISEASES OF CABBAGE AND ONIONS IN EUROPE, 1922.

By
J. C. Walker

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OBSERVATIONS ON THE CULTIVATION AND DISEASES OF CABBAGE AND ONIONS IN EUROPE, 1922.

By J. C. Walker,
Pathologist, Bureau of Plant Industry.

Introduction

During the summer of 1922 the writer visited several European countries, including England, Denmark, Holland, France, Spain, and the Canary Islands, under the authorization of the Office of Cotton, Truck, and Forage Crop Disease Investigations, Bureau of Plant Industry, U. S. Department of Agriculture. The primary purpose of this excursion was to study the occurrence of onion and cabbage diseases in western Europe and the culture of these crops in so far as it related to the development and distribution of disease. In order that the notes thus accumulated may be of use to others particularly interested, they are presented in the present form. In must be realized that the data acquired in this hurried manner is necessarily incomplete, and the reader is therefore requested to look upon them only as travel notes, and not as an attempt at a complete compilation of facts.

I am indebted to many in each country for the cordial reception and aid extended in each case. Among this number I should mention Mr. A. D. Cotton, Dr. W. B. Brierley, and Dr. E. J. Butler in England; Dr. Carl Ferdinandsen in Denmark; Dr. H. M. Quanjer and Dr. J. Westerdijk in Holland; Dr. E. Föex and Mr. Jean Dufrenoy in France; and Dr. Gonzales-Fragoso, Señor Luis Liro, and Señor Janini Janini in Spain.

ENGLAND

Cabbage Culture in England

The climate of England is almost ideal for the culture of cabbage and its close relatives. The mild winter permits the growing of cabbage through the entire winter period, while the cool, moist summer is especially favorable. Cabbage allies are grown more commonly than in America. Cauliflower, Brussels sprouts, kohlrabi, and kale are very common crops. The list of common cabbage varieties is quite different from that used in America. Since cabbage can be planted to mature at almost any time during the year, the solid head suitable for storage and long distance shipment is unnecessary. On the other hand, the English consumer prefers cabbage cooked as a "green", and therefore much prefers a head of loosely packed green leaves to a solid white head.

Cabbage and its allies are very common in small gardens everywhere. There are a few intensive cabbage sections, however. One of these which was visited, the Evesham district in the Avon Valley, a few miles from Stratford, may serve to illustrate.

Cabbage culture is very extensive in this section. The Stokes farm which we visited is about 600 acres in extent, and about 80 acres are in cabbage. The chief crop is the spring crop. Seed is sown in seed beds from June 15 to July 15. Transplanting is being done now (September 26). The crop grows throughout the winter season and matures in February and March. The winter is more or less frosty but the varieties used are hardy enough to stand this and keep on growing. The crop is cut very early in the spring if the prices are high.--even while the heads are very small and green. The chief variety used for the spring crop is Early Evesham; Early Offenham is another common variety of the same type. These both produce heads of a loose, pointed type.

Savoy cabbage is grown here commonly as a late fall and early winter crop. The seed is sown early in the spring and transplanting is done in June or July. The two varieties most commonly used are "Best of All"and "Drumhead". The former is the earliest and is beginning to be harvested now (Sept. 26). The fields are cut two or more times. This variety is not so hardy as Drumhead and will burst readily. Drumhead matures later and will stand for an indefinite period through the winter and can be thus cut and marketed as needed.

All transplanting is done by hand here as elsewhere in Europe. The foreman on Stokes' farm says 15 expert men will pull plants and set 12 acres in a good day when watering is not necessary. With the spring crop (Early Evesham) the plants are set 9 to 10 inches apart in rows 20 to 24 inches apart. The Savoy plants are set about 15 inches apart in rows ~~y~~ 30 to 36 inches apart.

Brussels sprouts are also grown here in large acreages. Fields of these are beginning to mature now (Sept. 26). Cauliflower is also grown commonly.

Cabbage farmers here as a rule grow their own seed. With spring cabbages a few are selected at harvest (early spring), pulled out and set out in one-yard squares in an isolated place. The plants lie dormant for a while and then send up seed stems and mature seed in August, which of course can not be used until the next June. Savoys must be selected in the fall and set out during the winter. Brussels sprouts maturing during the winter will send up seed stems at once and mature seed in time to be used the following summer.

Cabbage Diseases

One is impressed by the apparent lack of diseases of serious consequence upon cabbage and allied crops in England. The climate is no doubt almost ideal for this group of plants, and a number of diseases which are very troublesome in America are held in check either by environmental conditions or cultural practices, and probably by both.

Club-root (*Plasmodiophora brassicae* Wor.) is perhaps the most common and destructive disease of cabbage in England. In the Evesham district, however, large growers were evidently avoiding serious losses by judicious rotation and generous liming.

Black-rot (*Bacterium campestre* Sm.) is hardly known. A few cases have been found, but it has seldom if ever been known to occur in serious proportions.

Downy mildew (*Peronospora parasitica*(Pers.) DeBy.) is very common but seldom of serious consequence~~s~~.

White rust (*Cystopus candidus* Pers.).--Whereas this fungus is very rare on cabbage and cauliflower in America, it does often occur on these plants in England. At times it is sufficiently abundant to be of some economic importance. (Cotton).

Black-leg (*Phoma lingam* (Tode) Desm.) is apparently totally absent.

Yellows (*Fusarium conglutinans* Woll.) has never been found.

Black leaf spot (*Alternaria brassicae* (Berk.) Sacc.) was found at Wye, but is comparatively rare.

Ring spot (*Mycosphaerella brassicicola* (DuBy.)Lindau) is very common on all forms of *Brassica oleracea*. It is of little consequence on cabbage but is sometimes destructive to cauliflower.

Turnip and Rutabaga Culture and Diseases

Rutabagas and turnips are grown extensively for stock feeding purposes throughout Lincolnshire, Yorkshire, and northward through Scotland. The clubroot is the most common disease on these crops. Professor Potter says it occurs widely in the Newcastle district and on "all types of soil". By annual liming of the soil it is reduced to a minimum. The root-rot due to *Phoma napobrassicae*, described originally by Rostrup in Denmark, was found here some years ago by Professor Potter. It has since been found in a number of places in Scotland, North Wales, and southwestern England. It appears somewhat later than September and entirely upon the root. It has not been found on leaves or stems. While not generally common, it occasionally causes heavy losses in storage. Henderson suspected this to be the same as *Phoma lingam*, but I believe it must be different.

Mr. Whitehead, Pathological Adviser for northern Wales, has made trials with the Danish strains Nos. 4 and 25 of club-root resistant rutabaga, with marked success. (See Whitehead, T. Varieties of Swedes Resistant to Finger-and-Toe. Jour.Min.Agric. (Gr. Britain) *29*: No. 4, 1922.) While these varieties are not generally used as yet, these results indicate that they will be used in increasing amounts.

Turnip and Rutabaga Seed Growing

A large percentage of the seed for these crops is grown in Lincolnshire, Yorkshire, and as far south as Bedfordshire. I met a grower of this seed in the latter county in September. He told me that for the seed crop the rutabaga and turnip are sown late, i.e., in August, and when small roots have formed (not much larger than a lead pencil) the plants are transferred to the main field--about 50,000 plants to the acre. The crop remains in the ground throughout the winter and then matures seed the next July or August. The plants are cut and handled as grain and when dry they are stacked in long ricks. We saw stacks of rutabaga seed in his yard waiting to be threshed.

Mangels are handled in the same way--seed is sown in July and plants mature later than turnip the next year. We saw mangel seed still in shock. A good yield of mangel seed is 2,000 to 3,000 pounds per acre; a good yield of turnip, around 1,800 pounds. This man grows 100 to 150 acres of seed a year for Sutton & Sons, Reading. The stock seed is all furnished by the seedsman.

Onion and Leek Culture and Diseases

The onion is a common vegetable in England and is winter hardy as far north as Edinburgh. For spring bunching the seed is sown in August. The White Lisbon variety is used most commonly for this purpose. Bedfordshire is an important center for the autumn bulb crop. The seed is sown here in February or later. The plants are thinned out in May and harvested in September. A flat, light yellow variety, called Toogood's Monarch, and a light yellow globe type, called Up-to-Date, are the chief varieties. A large yellow globe, Ailsa Craig, is sometimes grown but is handled like the large yellow Spanish onion. It is sown in late summer, transplanted, and harvested the next summer. This crop is not able to compete with the Spanish crop, however.

The farmers here claim to rotate onions with other crops, and the practice is to put onions on the soil every sixth year.

The leek is a very common vegetable in English gardens. Starting from seed sown in the spring months, the plants approach maturity by autumn, but being very hardy, may stand through the winter and be taken up as used. A large leek growing section is located near Newcastle-on-Tyne.

Mildew (*Peronospora schleideni* Ung.) is one of the most common and destructive diseases of onions in England. It was found commonly on autumn-sown onions in September. According to Murphy, it survives as hibernating mycelium in some of such plants, which serve the next spring as centers of new infection.

White-rot (*Sclerotinia cepivorum*) is widespread on onions and leek throughout the British Isles. It was found to be very destructive on young autumn-sown onions at Evesham in September. Dr. Cotton finds it common also in the spring beginning in April or May. It becomes less noticeable during the warmer weather in July.

Smut (*Urocystis cepulae* Frost) is not of general occurrence in England. About four centers have been found in recent years and the disease is being confined to these areas as much as possible by local quarantine. The disease is common in market gardens around Edinburgh and Glasgow.

Rust (*Puccinia porri*) is common, especially upon leek.

Neck-rot (*Botrytis allii*) in certain seasons has been very destructive after harvest. In 1922 none was to be found in the crop in Bedfordshire. Here, as in America, this disease is very spasmodic, depending upon climatic conditions.

Smudge (*Colletotrichum circinans* (Berk.) Vogl.)--Though this disease was first described in England by Berkeley, it has not been considered common in recent years. An interesting case of it was found at Evesham in September on August-sown White Lisbon onions about four inches high. In one spot in the field a roughly circular area a rod or more in diameter, the plants had practically all been killed. Around the edge of this area plants in various stages of the disease were found. As a rule the outer leaf became flaccid and shriveled at the soil line and the lesion advanced upward from this point and to some extent downward. Fruiting bodies of Colletotrichum developed later on the diseased tissue, both below and above ground. The fungus invaded underlying leaves successfully and eventually killed the plants. It is probable that only plants which for some reason started off slowly or were attacked very young entirely succumbed. Many plants in other parts of the field showed fruiting bodies on the base of the outer leaf or scale. Vigorously growing plants might outgrow the disease. I have never seen in America the damping off of young onion seedlings by this fungus, but under greenhouse conditions I have seen young onion seedlings readily killed off when growing in inoculated soil. Under our northern conditions the soil is very cool while the young seedling is developing and the temperature is too low for very rapid development of the fungus. Under the conditions here observed the seedlings are growing in a comparatively warm soil with plenty of moisture--conditions very similar to those in the greenhouse where killing of seedlings readily occurred.

Scale nematode (*Tylenchus devastatrix*)--This bulb nematode occurs to some extent though it is not considered of great importance. As a rule affected scales turn to a watery decay caused by the soft rot bacteria which follow the eel-worm.

DENMARK

Cabbage Seed-Growing in Denmark

A large percentage of Danish cabbage and cauliflower seed is grown for export, and especially for America. The industry is largely in the hands of about a dozen seed firms which as a rule deal not only in cabbage seeds but also in numerous other kinds of vegetable and grass seeds. The seed is grown on contract by individual farmers who are supplied with stock seed by the seedsman. There is also one farmers' cooperative association(Danske Landboforeningers Froforsyning, at Roskilde) which handles the cabbage seed grown by its members, and it deals in other vegetable and grass seeds as well.

Growing Regions

The larger percentage of cabbage seed is grown in the southern part of the country. Very little is grown in Jutland. Some has been grown in the past around Aarhus, but I was told by Prof. Ferdinandsen that he had inquired and learned that there was practically none there this year. The two islands, Funen and Zealand (the latter, the one on which Copenhagen is located) produce most of the cabbage seed. The small island of Amager close to Copenhagen formerly was a cabbage seed section, but is now chiefly a truck farming area. Much cauliflower seed is still grown there. On the two first mentioned islands the areas which lie fairly close to the sea are preferred. Thus, in Funen the seed which we saw was all growing along the "Great Belt" or strait near Nyborg. On the other island we saw seed growing on the other side of the strait near Slagelse and on a small peninsula near Koge, about 30 miles south of Copenhagen. These sections have the advantage of the moderating effects of the sea which makes for milder winters and cooler summers.

Methods of Handling the Cabbage-Seed Crop

There are two methods of handling the production of cabbage seed which will, for convenience, be designated as (1) the "transplanting" method and (2) the "direct sowing" method. The two will be described separately. It is possible to give the dates of sowing, etc. only very roughly, since within each method they vary widely for the different varieties. The aim is to so start the crop that the plants will reach the proper stage by late October when they are conditioned for the winter. The late varieties therefore are sown first and early varieties last.

Transplanting method.--The seed is sown in seed beds some time in May. The plants are transplanted into the field some six or eight weeks later. The plants are set at intervals of 18-32" in rows about 2-1/2 feet apart.

Heads of good size are formed by October. The plants mature sufficiently so that careful roguing is possible. In late Odtober the field is rogued and all "off-types" cut out. The loose outer leaves of remaining plants are removed and the head is cut with about four inches of the stem remaining intact below the head. A new furrow is then plowed and the heads placed upright in this trench and covered so that the top of the head is only slightly exposed. These heads are 18 to 24 inches apart in the row and the rows about four feet apart. A little soil is thrown over them for the winter. In the spring it is removed and the head cut open to make way for the growing bud.

Direct sowing method.--The seed is sown directly into the field in a continuous row or in drills. These rows are about four feet apart, sometimes less. When the plants have two to four leaves they are thinned out so as to space one plant every 15 or 20 inches in the row. This sowing is done much later than in the transplanting method--usually some time in late June or July. The plants thus are only about half grown by October and no heads are formed. Obviously no roguing whatever is possible with this method. The plants are not protected during the winter. In the spring they produce seed stems.

Merits and uses of the two systems.--It is obvious that the transplanting method is by far the more reliable of the two. It is the only one whereby an accurate estimate of the type of the mother seed plants can be made. It is the one used for the "stock seed" and to some extent for "trade seed." The direct system has only one advantage to the seedsman--it is simp ler and cheaper. Early varieties especially are handled much more successfully for seed production by this system. My judgment is that this method is being used more each year and now is followed in the majority of the "trade seed" fields. It is used almost entirely for the early and medium varieties and of the five fields of late cabbage seed which I saw, two were grown by the "direct" method. This has been brought about, as one seedsman intimated, by strong competition for trade. It is to be regretted that low prices still have a decidedly greater influence in cabbage seed sales than quality and varietal purity.

System of selection and stock seed growing.--The methods of selecting and maintaining varietal purity are essentially similar to those followed by our larger American seed houses. Stock seed of each variety is produced from heads which are selected with great care as to uniformity. Such seed is grown by the firm itself or by some of their more reliable growers. The importance of careful selection for stock seed is the more necessary because with production of seed by the "direct sowing" method, roguing is not possible in the second generation.

Each seed firm which I visited had more or less extensive trial grounds in which large numbers of seed lots were being tried for varietal purity, etc. This end of the business is not unlike that of our own larger seed firms.

Isolation of fields.--The fields which I visited were all well isolated. One firm stated that they specify in contracts with growers that no other cabbage or closely allied crucifer may be grown within 600 meters of a given field; another specifies 1600 meters. The former figure is not large enough for safety. As stated above, the director of the state experiment station for field crops and plant breeding near Slagelse believes that pollen may be carried even greater distances by bees.

Growing of Yellows-Resistant Seed in Denmark

The only field of yellow-resistant seed growing in Denmark of which we learned was that owned by T. Madsen & Co. at Slagelse. This was started in 1921 from seed secured from Mr. W. S. Drummond, Racine, Wis., which, from what we know, was probably of a high grade as to quality and resistance. This field had suffered during the past winter, the stand having been reduced at least 50 per cent. The plants which were still standing were not large but well podded. The crop was grown by the "direct method". There was considerable ring-spot on leaves and stem; but no blackleg nor black-rot was found. The field was well isolated. Yield estimated at 200 kilos. (An unusually rainy period during harvest reduced this crop still more and only 40 pounds was actually secured. A trial from the lot amde in 1923 on yellows sick soil showed that the single generation removal from sick soil did not reduce the resistant quality.)

Cauliflower Seed-Growing

This crop requires much more care and skill in handling than the cabbage seed crop. It is grown mostly on the island of Amager where the farmers are equipped with greenhouses and are successful truck gardeners. The seed is sown in the fall in seed beds. The plants are transferred to pots and grown in the greenhouse through the winter months. As soon as the weather permits in the spring, the plants are reset into the open field where they produce flower stalks and seeds. The cauliflower fields were in bloom when I visited them; the cabbage seed fields had long finished blooming and were approaching maturity. The cauliflower seed does not usually mature until September. The culture of this crop is very expensive and a much more hazardous venture than the cabbage seed crop, consequently the price of Danish cauliflower seed is very much higher than that of cabbage seed. Mr. Knudson of the Hartman Company says that Holland and Italy produce a cheaper grade of cauliflower seed for America, which is handled much like the "direct" system used for cabbage. In Holland, I was also told that most of the seed produced for export was handled by the "direct system."

Occurrence of Cabbage Diseases.

Ring-spot (Mycosphaerella brassicicola) is the most common. It is exactly similar to that which occurs on crucifers in America. The leaves, stems, and pods of cabbage seed plants often become badly spotted and in extreme cases it may reduce the yields considerably. In the fall it becomes very widespread on the young cabbage crop. Dr. Ferdinandsen has noticed during several years' observations that this disease is as a rule much more common on the seed plants which are produced by the "direct" method than on those by the transplanting method. In our current observations this was found to be true almost without exception. In the same locality, fields grown by the "transplant" method were almost completely free from ring-spot and those grown by the "direct" method were sometimes very badly diseased. Separation of the newly planted crop from the maturing seed crop is an important measure of control.

Black-leg (Phoma lingam).--We found no evidence of this disease in any of the seed fields visited. In the trial garden of Hartman & Company near Copenhagen a plot of red cabbage contained numerous plants decidedly stunted but not wilting. When pulled these plants showed complete decay of the fine roots and of the cortex of the stem and main root below ground. No evidence of pycnidia above ground was to be found, but in the decayed woody tissue of stem and root were many pycnidia. The size of the latter and of the spores were within the range of Phoma lingam. Further culture work, however, showed it to be different from our American form of Phoma lingam.

Aside from one other case of P. lingam on cauliflower in hot beds at Amager, Prof. Ferdinandsen says there is no authentic report of Phoma lingam in Denmark. Phoma napobrassicae has been found from time to time on the roots of swedes and turnips, but it is not commonly reported. This is evidently distinct from our cabbage Phoma.

The "direct" method of producing seed in Denmark is favorable for the control of Phoma lingam. The crowded culture of plants in the seed bed where the fungus spreads most rapidly and effectively is eliminated. This may be one reason why it has never become a serious factor there.

Black-rot (Bacterium campestre).--We found none of this disease in any of the fields visited. However, Prof. Ferdinandsen says he has seen it at times on cabbage and perhaps more often upon rutabaga and turnip. It is thus, no doubt, as we have previously found in America, liable to contaminate cruciferous crops in Denmark.

The present survey leads one to believe that the Danish fields are in general quite free from our two most serious seed-borne diseases, black-leg and black-rot. We may assume that black-leg at least is quite rare, and that black-rot is not common, though individual fields may undoubtedly become infested. For the further production of seeds in which individuals or seed firms in America may be especially interested, such as yellows-resistant strains, inspection of the seed fields for freedom from these diseases and for complete isolation is desirable.

White rust (Cystopus candidus).--We found this in one cabbage seed field near Nyborg. Lesions were common on leaves and pods, often causing considerable distortion of the latter. There was no evidence of systemic invasion of the flower parts as commonly seen on radish. It is said to be even more common on cauliflower, but we did not find it again.

Club-root (Plasmodiophora brassicae).--This disease is widespread in Denmark but evidently not of great importance in the southern provinces, which are of limestone formation. In Jutland there is much acid soil and root crops are important. Club-root is very serious in these sections. Two strains of club-root-resistant rutabagas (Nos. 4 and 25) have been selected at one of the Jutland stations and are now produced commercially. These strains have been recently introduced into Wales.

HOLLAND

Cabbage Culture and Diseases.

The Alkmaar District

This section is interesting from the agricultural standpoint. Most of Nord Hollande is below high tide level. It is protected on the west by sand dunes. A large canal protected at each end by locks or sluice gates is built from Le Helder to Amsterdam. From subsiliary canals and ditches the water is lifted by windmills or other pumps into the great canal. At low tide the sluice gates are opened and the water let out; as the tide rises the gates are shut. Most of this country is thus a series of islands three or four rods wide and 75 to 100 yards long. These are separated by canals one or two rods wide. The fertile soil is used for intensive culture of cabbage, early potatoes, onions, etc. The only access is by boat and even the horses must be taken out by boat to plow or cultivate.

Cabbage Varieties

The chief varieties used are:

(1) Winter Roode (Winter Red, Hollander type, hard, globe head, good keeper.)

(2) Vroege Roode (Early Red)
(3) Wit (Early White)
(4) Deensche Wit (Danish White, a late ballhead for storage and what we call Hollander type.)

Seed is all grown locally but little or no seed is grown other than for domestic use. In order to avoid cross pollination of the several varieties of seed grown in this small section, the farmers' associations parcel out the territory into sections within each of which only a single variety of seed can be grown. A good deal of cauliflower is also grown.

Cabbage Storage

Storage of cabbage is done in cellars or special warehouses along with potatoes. Potatoes are stored in shallow boxes but cabbage is stored in bins or stalls separated by narrow channels for ventilation. During the winter heads are selected for good keeping quality, shape, etc., and these are used for seed. Thus the plants are not pulled with roots for seed, but the cut heads are simply planted out the next spring. For commercial seed production the seed is sown later and the plants wintered over in the field.

Cabbage Diseases

This is the section in which Ritzema Bos and Quanjer worked on the Phoma disease of cabbage some fifteen years ago. It occurred then as a storage decay and also as a stem rot and wilt in the field. They did not recognize it as a seedling disease, nor as a seed-borne disease. Of recent years apparently no black-leg has been encountered and all the fields which I saw were free from this disease. Mr. van Plassche says he has not seen any of the disease in recent years, and Dr. Westerdijk later told me she had been unable to find any of the disease in Holland.

Black-rot seems also to be very rare. In the market gardens around the larger cities club-root is common but in the Alkmaar section it is not known.

On September 4, while visiting the onion and potato growing sections of the Island of Overflakkee, near Rotterdam, I found in a small garden that black-rot occurred commonly on Savoy cabbage, common white cabbage, red cabbage, cauliflower, and Brussels sprouts. Club-root was also more or less common in this section.

Commercial Cabbage Seed Production

On September 5, I visited Sluis en Groot, at Enkhuizen, a short distance northwest of Alkmaar. They grow especially flower seeds and cabbage and cauliflower seeds. Their methods of growing are quite similar to the Danish system. For trade seed the seed is sown late and the plants grow through the winter. For stock seeds the plants develop heads in the autumn. The entire plants are then pulled, piled, and covered with straw and dirt for the winter. Cauliflower seed is sown in September; the plants are carried through the winter in hotbeds and set out in the open in the spring.

I saw some indications of early marginal infection of black-rot and a little Mycosphaerella in these gardens, but no Phoma.

Onion Culture and Diseases

July observations at Alkmaar.

Onions are grown to a considerable extent in the Alkmaar region. Another important section is on the Island of Overflakkee near Rotterdam. The horticultural agent in the latter section is Mr. C. Stevens, Rykslandbounconsulent, Goes, Zealand. In both of these places onion seed is sown broadcast over the beds in April. Harvest takes place in September. Much seed is raised in Overflakkee for export, especially to England. The chief varieties are the Dutch Brown and the Zealande White. After Harvest the bulbs are stacked in the field in shallow crates and left there until sold. Many are shipped to England; last season some were imported by the United States. In the Alkmaar section we found no diseases. Dr. Westerdijk and her students had just returned from Overflakkee (July 18-19). They found in small amounts: Sclerotium cepivorum, Urocystis cepulae, Peronospora schleideni, Macrosporium parasiticum; the last two were on seed onions. It has been very dry in Holland during May and June, and mildew has started only with the recent rains. Tylenchus devastatrix was also found on a few onions in Overflakkee. Onion root maggots are destructive in both regions.

September observations at Overflakkee, 1922.

On September 4 I went with Dr. Westerdijk to the Island of Overflakkee, one of the group at the mouth of the Rhine, a few miles east of Rotterdam. It is a very intensive gardening center. Potatoes and onions are grown extensively; sugar beets are common; carrots are also grown to some extent. Potato Phytophthora appeared as usual this season, but did not develop very rapidly. Potatoes were being harvested. They are piled in the field and covered with straw and soil for the winter.

The onion crop for the most part was still unharvested. A yellow variety is used there entirely. Most of the seed is home-grown. The seed is sown in the spring, usually broadcast, less often in rows 8 to 10 inches apart. The bulbs are pulled when the tops fall over. They are thrown in windrows until the tops are thoroughly dry--a fortnight more or less, depending on the weather. Storage then is done in the field. The old method is to pile and cover with straw and soil. The modern method is to pile in cribs made from wire netting and cover with straw. The latter system is similar to the Spanish. The tops are not removed until after storage when the bulbs are ready to ship. They claim to have very little frost there--not sufficient to injure the onions. The practice of leaving on the tops is probably one reason why they report practically no loss in storage. With the prevailing moist weather there one would expect Botrytis to occur commonly, but Dr. Westerdijk says they have practically none of it.

Onion smut is common; the growers do not fear it, however, since it has been here a long time and is confined in severe form to only one area where onions have been grown repeatedly for several years. In general the crop is rotated with other things and the smut has not increased rapidly enough to reduce yields materially. The fact that the seed is sown broadcast may reduce the actual losses due to smut.

White rot (Sclerotium copivorum) is common but not very abundant. It was claimed to be worse than usual in 1922 after the cool, wet season. As we found it, it affected the plants which have produced good sized bulbs. The infection in most cases appeared comparatively recent. Young plants which may have been killed earlier had disappeared but there was no evidence of any marked reduction in stand due to these earlier attacks. The infection is always at thebbase of the bulb. Sometimes half of the bulb was decayed, at other times only the outer scale was affected. Growers do not consider it a serious storage rot.

Mildew (Peronospora schleideni) and leaf mold (Macrosporium parasiticum) were present to some extent on the seed onions. The mildew started earlier in the season but did not advance very rapidly.

The Tylenchus disease is evident on many onion bulbs. It is usually followed at this stage with soft rot. Certain areas in this section are avoided for onion culture because of this nematode.

Potato Diseases in Northern Holland

Mosaic troubles while of much less occurrence in this part of the country are more or less present. Many stocks are showing them this year which did not previously. Last year was unusually dry and warm, and aphids were common, leading undoubtedly to a much wider dissemination of the virus diseases.

Phytophthora infestans is just starting (July 18). It may become serious, depending on weather conditions. Spraying is practiced.

Rhizoctonia is often serious on early shoots. Mercuric chloride treatment is used commonly.

Common scab is serious at times.

Black wart is confined to one isolated area in eastern Grönigen.

Verticillium may be very serious.

FRANCE

Onion Culture

The onion is cultivated widely in France but large scale production in any one center is not common. The north coast of Brittany has a considerable acreage, some of which is exported to Great Britain. In this region the seed is sown in the autumn and the plants transplanted during the winter. This method of culture is used from this point southward, while as one goes northward from this point, spring sowing becomes the more common.

Onion Diseases

Mildew (Peronospora schleideni) occurs, its severity depending upon weather conditions. Macrosporium parasiticum commonly follows the mildew.

Smut (Urocystis cepulae Frost) has been known in France many years. As a conspicuously destructive parasite it has not attracted wide attention, however. Where transplanting is common it has probably been largely avoided. No control measures have been introduced.

White rot (Sclerotium cepivorum Berk.) was found on onion and garlic in Brittany, and also on onion bulbs in the Paris markets. It had been collected many years ago in various parts of France, but in any onion fields I visited was not known as a seriously destructive disease.

Neck-rot (Botrytis sp.) was found in the Paris markets in August.

Smudge (Colletotrichum circinans (Berk.) Vog.) was common on white varieties in the markets in August.

Bulb nematode (Tylenchus devastatrix).--According to Dr. Föex, this is reported occasionally on onions.

Seed Growing in Southern France

St. Remy de Provence, about midway between Marseilles and Avignon, is the center of a large vegetable seed growing section. There are several seed firms, some of them growing seed only for wholesale. Common vegetable seeds grown are carrots, beets, radishes, escarolle, spinach, lettuce, onions, and cabbage. The climate there, which consists of mild, rainy winters and warm, dry summers, is especially favorable to seed production.

For onion seed production the seed is sown in March; bulbs harvested in August; bulbs set out in October; seed harvested in July. The common varieties are: White Lisbon, White Barletta, Queen, jaune paille des Vertus, rose de Bonne-Garde, rouge fonce, rouge de Salon, de Madere plat. Onion seed fields were free from diseases. In some years the mildew and leaf mold are destructive.

For cabbage seed production, seed is sown in July; transplanting is done in September; the plants grow throughout the winter and seed is harvested in July. The varieties are largely French and are grown for the French and other southern European trade. The cabbage seed fields were quite healthy. The only disease found was the Alternaria leaf-spot, which was of minor importance.

SPAIN

Onion Culture at Valencia

The eastern coast of Spain from Barcelona or above to Alicante, has a narrow strip of flat alluvial soil, which is very fertile, and with the help of the water from the near-by mountains almost anything can be grown. The Valencia district extends from about Castellon to a little below Denia. Oranges are the crop of first importance; onions are second. Some 5,000,000 bushels of the latter were exported this past season (1921), of which about 2,000,000 were sent to America. There are two main crops of onions grown: the early crop, known as the "Babosa", which is a flat, white onion, a poor keeper, and is shipped mainly to nearby markets, the main export going to England; (a few go to America, but not many because of the poor keeping quality.); the late crop, known as the "Grana", which is the large yellow globe onion we are accustomed to see in our American markets. This is the principal onion crop of Valencia. From this Spanish variety our popular variety, the Prizetaker, is said to be a selection. The Babosa onion is sown in August, transplanted in December, and harvested in June and July; the Grana onion is sown in December, transplanted in April, and harvested in late July, August, and September.

Two methods of transplanting are used: (1) where there is plenty of water for irrigation, level beds are made about three yards wide, irrigated, and plants set out in rows about 12 inches apart. Irrigation is continued as necessary, but is reduced to as little as possible as soon as the plants have well recovered from the transplanting; this is done to encourage the roots to grow deeply instead of remaining near the surface of the soil; a thin mulch is kept on the surface of the soil, and weeds kept out. (2) Where water is not so prevalent, ridges are made in the field about 14 inches apart and upon each ridge two rows of plants are set about 9 inches apart and about 4-1/2 inches apart in the row. Irrigation is handled as above.

Cultivation is done mostly by hand. The fields are not large. The district is held in small areas by hundreds of peasant growers. The largest fields are seldom more than two and one-half acres in size. Practically all of the labor is done by hand and by each grower's own family.

Commercial fertilizer is used liberally; manure is avoided because of its "tendency to encourage plant diseases".

Rotation is encouraged by the agronomical engineers, and is quite generally adhered to, but not always, especially after a year of high prices. The common rotation is as follows: onions, April to September; clean culture for a few weeks; wheat planted and harvested the following June; clean cultivation June to September; sow vetch or other legume crop for forage or green manure; plow under in March; cultivate until April; plant onions.

The crop is harvested as stated above. The Babosa crop is shipped at once. The main Grana crop is shipped in part at once and the remainder is stored in cribs built much like our latticed corn cribs, where they remain until finally disposed of. The selling and packing goes on from these cribs throughout the winter. Some may be held as late as March. As a rule the American exports are pretty well over in December. There is no freezing weather at Valencia. However, there is here the opportunity for storage rots to become quite well advanced before the bulbs are packed. It thus must become a matter of proper sorting at packing time as to whether or not good stock is shipped. From what I can learn the bulbs are piled in these bins three or four or perhaps more feet deep. Moreover, the weather, while ordinarily very dry, may be very humid for several days at a time. These rainy periods are very spasmodic in the summer, but more or less common in the winter.

The reported average yields are about 500 bushels per acre, but maximum yields of 1,800 bushels have been reported. Prices vary widely according to the world supply. Last season in the early part farmers were receiving one peseta (16 cents) per box, but at the end of the season they were getting as high as 14 pes. per box. These higher figures brought in some cases as high as $2,000 return per acre.

The seed is all home grown.

Since the onions at this time (early May) have only been transplanted about four weeks, they are still quite small and quite healthy. For this reason I have not made a long stay at this time, with the idea of returning here in the latter part of July at the time when harvest is on. I have discussed matters with Mr. Janini, who is the provincial engineer, and has been in the province now for many years in this work. He is not a pathologist but has studied plant ~~id~~ diseases somewhat and is posted on the maladies of the vine. It is certain that losses in onions due to diseases have not been sufficiently noticeable to have been brought to his attention. He states that at times when a period of very moist weather occurs, the downy mildew develops very rapidly on the potato, ~~on~~ onion, vine, and other plants, and may be very destructive if the conditions last. As a rule, however, the drying winds from the plateau serve to check the trouble very quickly. If these moist periods occur in July, or later, the soft rot and Botrytis may develop in the onion. He was not sure that he had seen Fusarium rot on the onion, but suspected that pink root did occur. The white rot, Sclerotium cepivorum, he had never heart of. I have not been able to find any clue as to its existence in Valencia.

From the American Consuls at Valencia and Barcelona the following data regarding the exports of onion and garlic to the United States from Spain have been secured:

Total Exports (to all countries)		1919	1920
Garlic,	metric tons,	5,505	6,226
	value in pesetas	2,477,291	2,801,770
Onions,	metric tons,	149,523	137,239
	value in pesetas	14,952,317	13,723,914
Exports to United States (Continental)			
From Barcelona,	onions, pounds,	641,703	-------
	garlic, pounds,	-------	-------
From Malaga,	onions, pounds,	-------	-------
	garlic, pounds,	292,285	90,927
From Valencia,	onions, bushels,	869,997	1,146,573
	garlic, pounds,	-------	181,000
From Alicante,	onions,	-------	-------
	garlic, tons,	-------	287
From Canaries,	onion seed, lbs.	69,592	61,945
	tomatoes, bushels,	-------	6,394
Exports to Porto Rico			
From Barcelona,	garlic, dollars,	386,498	209,407
From Coruna,	onions, dollars,	8,366	13,258
From Valencia,	garlic, dollars,	110,160	22,947
	paprika, dollars,	7,449	23,828
From Canaries,	onions, dollars,	23,620	43,252
From Alicante,	garlic, pounds	------	12,820

These data are compiled in a publication by the Department of Commerce, known as "Supplement to Commerce Reports--Spain."

Onion Harvesting, Packing, and Shipping at Valencia

The study of the onion crop and its diseases was continued from August 10 to 20 in the immediate vicinity of Valencia. The onion growing is centered around this city, extending for some distance to the west, slightly to the south, and roughly 10 or 15 miles to the north. The entire area where this crop is cultivated is a flat coastal plain of heavy soil which becomes very hard when not thoroughly worked. There are no large farms, the entire area being divided into small peasant holdings or "huertas" of 6 to 10 acres each.

Onions are the chief cash crop in the immediate vicinity of Valencia. The acreage this year was undoubtedly somewhat above normal, dur to the unprecedented prices of last season. The yields this season were good. As a result at this time, just after harvest, there are many onions with very little demand. Good prospects for a normal production in the United States have reduced demands from that market, and practically no onions are moving to America as yet. The exports so far are to England. One American buyer who bought heavily here last year says he will buy no onions here this season.

Harvesting

The crop has practically all been harvested. There is an occasional field still not pulled, and these are probably of ~~th~~ the latest planting. By the time the bulbs are ready to harvest, the root system is practically dead--such is the condition of onions still standing. The tops at this time are dying down but not entirely dried out. The bulbs are pulled and thrown in windrows, where they remain two, three, or four days. The tops are then cut, leaving one- to two-inch necks, which usually are still slightly succulent. The bulbs are thrown into large piles in the field and covered with the onion tops. They remain in these piles some days. If the crop is sold and to be packed at once, the bulbs are crated directly from these piles. If they are not to be packed at once, they are sorted and piled in the open shed or barranca, which is unique to this section. It is made from the stems of a native cane which are used to make the side walls. A gable roof is made from small reeds which are sealed with mud for 12 to 18 inches down from the peak. The onions remain in these bins until packed for shipping, which may be as late as February or March.

Method of Sale

The onion grower sells his crop in the field usually at harvest or in the bin. The time will vary according to the demand. The buyer in most all cases takes the crop for so many pesetas per crate in the pile or bin. He has his own packing crew, furnishes his own crates, etc. The peasant's responsibility ends when his crop is in the pile or bin. The buying is done by local Spanish or English merchants, who in turn sell to

English or American houses; or American firms buying in siffi*cient quantity may send a representative to Valencia for the season, who buys and looks after packing and shipping. English and American buyers and Spanish, as well, each have their native "comprador," who is the intermediary between buyer and peasant. He buys under direction and superintends the packing of the crop. Women and children do the packing (See Fig. 4). It is done in the field and all decaying bulbs are thrown out at the time. Since the buyer pays only for crates of sound onions, it is to his interest to have the packing supervised carefully and all bulbs showing any evidence of decay removed.

Packs and Grades

The onions are graded as they are packed. This is all done by hand; no grading screens are used. This method was started by a local Spanish merchant, Mr. Corelli, about 20 years ago. It probably did more than anything to put the Valencian onion on a permanent footing in the world market. It is considered the best onion pack in the world and the cheapness of Spanish labor enables this section to compete favorably in this respect with any other section.

There are four standard grades of the Valencia onion, known as 3's, 4's, 5's, and 6's. These numbers refer to the number of rows of bulbs packed across the standard "case", which is about 15" square and 40" long. No 3 grade therefore are the largest onions, of which only three rows can be packed. These are never packed in this case, however, but are always shipped in smaller boxes, known as a "crate", about 25" square and 8" deep, 50 bulbs to the box. The No. 4 grade takes 72 bulbs to the smaller box or four rows in the larger crate. Nos. 5 and 6 always in the larger crate, are 5 and 6 rows across, respectively. No. 4 grade is the most abundant. Nos. 5 and 6 are about the same size as our "Middle West" Yellow Globe onion. These latter grades bring a higher price in England; consequently United States gets mostly 3's and 4's. An American buyer who is on the job when he buys from a local shipper specifies in the bargain for a certain percentage of 5's and 6's. This is usually around 12 or 15 per cent of the total; otherwise he receives only 3's or 4's. The No. 3's are not considered desirable; they do not sell as readily and do not stand shipping as well as the smaller bulbs.

As the bulbs are packed, loose outer scales are removed and those bulbs showing decay are removed. Fusarium root rot, bacterial soft rot, and black mold are well recognized by the peasants and especially by the compradores.

The cost at present of the lumber, sorting, packing, hauling to the quai, and stenciling is about 4-1/2 pesetas (70 cents) per case.

Shipping

The crates are hauled in small two-wheeled donkey carts over the rough roads--sometimes for many miles--to the quai at the port of Valencia. This is a large and spacious dock with abundant warehouse space. The harbor, however, is so crowded with vessels that ships are anchored some rods from the quai, and all the cargo is carried out on barges. This has the disadvantage of exposing the onion crates on the lower tier to the splashing waves. One buyer tells me that it is almost impossible to avoid wetting of a part of the cargo during this loading process. Such crates have little opportunity to dry out and of course the conditions thus become more favorable for soft rot, black mold, and probably also for Fusarium rot. Tiers of crates in the hold of the bessel are separated by narrow alleys, which facilitate air circulation. The tiers are braced with strips of lumber to prevent sliding during the voyage. It is not possible, however, to entirely eliminate the moving of the crates during rough weather.

Occurrence of Onion Diseases

The three diseases occurring upon the onions at this time were Fusarium rot, bacterial soft rot, and black mold. No Botrytis was found, and no *Sclerotium cepivorum*. It was probably a little early for Botrytis, especially since there is practically no rain at this season of the year.

Fusarium rot (culona).--This disease was found in practically every field visited. The symptoms were typical of the disease as we know it in America. It is associated more or less with maggot or other insect injury at the bases of the scales. Judging from what the peasants tell me, it may develop earlier in the season and cause the death of the plant before maturity. In most of the fields the onions had been sorted and placed in the bins. Around every such bin the ground is either strewn with decayed bulbs or the latter are thrown in a large pile near by. At this time the disease is in an early stage. The root system, as a rule, has completely disappeared and there is often evidence of Fusarium mycelium or sporulation or both at the base. In case of insect complications the decay is more advanced and bacteria are commonly present. All bulbs which show macroscopic signs of the disease are supposedly thrown out. It is evident, however, that many incipient infections are overlooked. This was shown by the fact that bulbs which I selected as free from Fusarium rot and took to France with me, after a week showed evidence of the disease. Thus we may expect the same thing to develop in the bins and in transit.

As stated above, Fusarium was found almost universally present around Valencia. From what I roughly estimate, one to five per cent of the crop is thrown out already because of Fusarium and soft rot. There is another sorting when the bulbs are removed from the bins, when even a higher percentage may be rejected. I have been told by peasants of losses of 25 to 75 per cent in the bins, but such figures are not necessarily to be taken as reliable.

Bacterial soft rot.--This is known among the peasants as "Enfermedad del cuallo," or "pichona." Where the outer fleshy scales are affected, in which case black mold usually follows, they term it "entelat" (Valenciano) or "entelado" (Spanish). This disease is considered by growers and buyers as the most destructive and most dreaded. Its occurrence here on this heavy clay soil is interesting, since from limited observation I believe it occurs in America more commonly on heavier soils. In Orange County, N. Y., where it occurs perhaps as regularly as anywhere, I have been told that it is more prevalent on the clay soil.

The infection undoubtedly takes place sometimes before and sometimes ~~a~~ during harvest. It is very difficult to detect (in America) before the onions are pulled, and since practically all the fields were past this stage here, I did not have an opportunity to observe this point. In the one or two fields still standing, a little evidence of it was noticeable, especially in connection with maggots working in the neck of the bulb. The tops of the bulbs are cut soon after pulling, when there is still some sap left in the tissues. This is favorable for dissemination of the bacteria at the time.

After the bulbs have lain in piles for about a week and are sorted over for the bins, the disease is evident. The women who work at this are quite keen in detecting these early stages. It may consist of only a slight watersoaking of one or two scales at the neck; or in more advanced cases the scales may be rotted for some distance and the watery decay can then be readily detected. One or more scales may be affected. As the rot progresses the parenchyma tissue disintegrates and small yellow patches are noticeable just beneath the epidermis. This symptom is especially distinct upon the Valencian onion. I presume it may be found to be the flavone coloring matter in the epidermal cells which has aggregated as a result of cell plasmolysis, but this is only a guess.

It is obvious that this disease is as much or more difficult to remove entirely by sorting. It is thus to be expected that more or less soft rot decay will develop in storage and transit.

One buyer (Spanish) claims that the keeping quality of the Valencian onions is determined entirely by the irrigation. The first two months and the last two months he claims are the most critical. The peasants follow a more or less orthodox system of iffigation. After the seed is planted with two irrigations at two-day intervals--then 20 days without irrigation--then irrigation every 8 days until transplanted. At transplanting plenty of water is given. Then after plants are well started, watering is stopped as long as possible to encourage deep rooting; then irrigation continued at 8-day intervals. They state that when plants "show disease, irrigation helps them to keep on growing--to shut off water would make them dry up at once." No doubt too much water during the last part of the season tends to make a larger but softer onion with a larger, more succulent neck, more susceptible to decay.

Black mold (Nigrella).--There was very little of this present on the onions. It was found occasionally and growers recognize it as a very serious disease, causing much damage during storage. It commonly follows soft rot and Fusarium, especially where the former affects the outer scales. Its prevalence no doubt is largely influenced by the weather. At harvest time it is usually dry, but rainy spells may come. In such weather the disease spreads very rapidly and if widely disseminated during harvest and sorting, continues to develop in storage. The method of storage is not the best, especially if the crop is not thoroughly dry when placed in the bins.

Factors Affecting Onion Diseases in Transit

One would expect from the nature of these diseases as they occur in the Valencia district that the early shipments would be the most liable to decay. The earlier the packing is done, the less the opportunity to sort out decay. In the two weeks which is the minimum to be allowed for transit to New York, soft rot can increase considerably. In lots which remain for some weeks, incipient infections have time to develop sufficiently to be detected. I believe a large percentage of the infection of Fusarium and bacteria takes place before storage and that new infections in the bin are few. Assuming this, the later the packing is done, the better it will carry. Mr. Fenger, of A. Rosenblum, Brooklyn, who bought heavily in Spain last ~~summer~~ season, says he has found this to be true. The packing and shipping continue up to December or later.

Another factor which may be noted in this regard is that of delay in shipment due to dull markets. Local buyers having bought up the bins may continue to pack without orders for shipment. This results in the bulbs standing in crates on the quay for indefinite periods. The present slow market is an example of this. The quai is filled with onion crates which are not moving. An American house then may place an order some days or weeks later and get onions packed in the early season which have stood in crates for some weeks. Thus by the time they reach New York decay may be well advanced.

Garlic Culture and Diseases

At Barcelona I learned more of the Sclerotium cepivorum disease from Prof. Caballero. I later visited the area where it is so common. This is in the province of Gerona, in the vicinity of a small village by the name of Banolas. The latter may not be found on every map. It lies about 40 kilometers northwest from the town of Gerona, and is accessible only by motar car. There is an extensive acreage of garlic in the neighborhood of this village; large quantities of it are exported annually. Since it is shipped either from San Palamos or Barcelona, it would be included all under Barcelona in the above table (p. 19). Evidently we did not receive any from here in the United States in 1919 or 1920, although some quantities went to Porto Rico.

The garlic crop was at the early bulbing stage when I saw it. The disease, which is known as "boixat" (bwa-chat), had already caused marked damage this season. As a rule the disease appeared in roughly circular spots in the fields. In the severely infested areas nearly all the plants had disappeared, in others the plants were just beginning to show the trouble. The symptoms above ground are yellowing of the lower leaves, the upper leaves yellow and die progressively, and finally the entire plant dries up. In the earlier stages if the plant is pulled, it comes up readily and the root system is found to have rotted off, while beginning at the base of the leaves a semi-watery decay sets in and works upward. The gray mycelium of the fungus is usually more or less evident, and the characteristic small black sclerotia appear quite early, becoming very abundant as the disease progresses. Oftentimes 50 per cent of the crop is taken.

A local veterinarian and fertilizer dealer has been interested in this disease for a number of years, and has this season several experimental plots in which he is trying the effects of application of a superphosphate, ammonium nitrate fertilizer, upon the disease. Surprisingly, he seems to be securing a marked degree of control where the fertilizer was applied. (See figure 6.)

The same disease also occurs in another section nearer Barcelona. Prof. Caballero also stated that a small amount had been reported from near Seville. In the Banolas section it has been destructive for twenty years or more. There are few onions grown at Banolas and they had been only recently planted. The local men stated, however, that about a month later there would be plenty of the disease on onions. I found a small amount in a garden containing a few early onions.

We therefore are now sure that this disease is well established in Spain in at least one section. There is no report of it in the Valencia section and if it were at all common it would come to the attention of the government men. There is some garlic raised in the Valencia district, however, and its introduction is liable to occur at any time. It undoubtedly can be as destructive on onion as upon garlic.

A later report from Senor Liro of Malaga states that the disease is common in southern Spain wherever garlic is grown. Here also the garlic crop is confined to the mountainous villages and this is the case as well in the Province of Valencia. It is probable that the garlic thrives better at a somewhat higher altitude. By contrast, the onion is produced with more success on the low coastal plains around Valencia and in northwestern

Spain in the vicinity of La Coruna.

THE CANARY ISLANDS

Onion Bulb Production

Most of the onion crop of the Canary Islands is grown on the island of Lanzarote, where the average production is about 100,000 quintals (about 200,000 bushels) per year. There is an early crop which is propagated by means of sets and matures from November to March. This is all consumed locally. The export crop is grown from seed which is sown in the autumn in seed beds, transplanted some six or eight weeks later, and harvested beginning in March and ending by the middle of last of June. I did not visit this island since the crop was entirely harvested and largely shipped before my arrival. A cargo of onions from this section was examined in the port at Santa Cruz. The Bermuda type is used entirely and practically all are of the Red and Yellow varieties. The bulbs are pulled and allowed to cure with the tops still attached. Then by a process of braiding the tops with wheat straw , they are placed in bunches of two to three dozen onions each. This is the universal method of harvesting onions in the islands, both for export and for the purpose of storage for the seed crop. It is undoubtedly a commendable practice, inasmuch as it insures a more thorough curing of the tops, sealing the necks with the least possible amount of infection. The weather is almost always free from rain during June, so that the later and perhaps larger portion of the crop is harvested during favorable weather. There is undoubtedly, however, the liability to the same diseases during transit as experienced in our southern Bermuda crop if humid weather or improper curing and handling occurs. In the Lanzarote onions examined I found in small quantities neck-rot (*Botrytis allii*) (entering through wounds), soft-rot (*Bacillus carotovorus?*) (starting at the neck of outer scales), black mold (*Aspergillus niger*), yellow rot (*Macrosporium sp.*), plenty of evidence of pink root (*Fusarium malli*), but no Fusarium bulb rot. Ordinarily the bulbs are prepared very soon for shipment by packing the bunches in hexagonal crates.

In none of these onions is any attention paid to size grades. All the onions from the very small to the very large are included without any sorting. Of course this type of pack would meet objection in the United States markets. As a matter of fact, no Canary onions are exported to the United States. The bulk of the crop goes to Cuba and Porto Rico and smaller quantities to Mexico and South American countries.

There is a smaller quantity of onions grown on the Island of La Palma. Yellow and White Bermuda varieties are grown. This crop is slightly later than that of Lanzarote, however, starting ~~1st~~ in late June or early July.

Onion Seed Production

Dates of Planting and Harvest

My own field observations were confined to the Island of Tenerife. Here practically all of the onion seed is grown and also the bulbs for the planting of the seed crop. The latter are started from seed in the autumn, transplanted some weeks later, and harvested in late June or early July. They are then stored until October, when they are planted for the production of seed. The seed crop is harvested the following year, beginning about the middle of June and continuing throughout July.

Varieties, Output, and Markets

Seed of the Bermuda varieties only is grown on the Islands. Of the three colors, the largest percentage is yellow, the next white, and the least is red. It is said that 80 to 90 per cent of the crop is exported to the United States, where it is used in our southern states and largely in Texas. Other countries taking smaller quantities are Bermuda Islands, Porto Rico, Cuba, and South America. Little or none is shipped to Europe. A summary of the exports of onion seed from the Canaries to the United States as taken from consular reports made available to me by the kindness of American Consul Henry and Vice Consul Phelan at Tenerife is as follows:

Year	Amount in pounds	Value in dollars
1909	--------	57,170
1910	--------	36,509
1911	--------	30,753
1912	--------	74,686
1913	95,516	85,578
1914	43,350[a]	45,841
1915	40,749	41,801
1916	76,487	84,387
1917	128,620	137,289
1918	94,045	--------
1919	71,630	--------
1920	63,028[b]	--------
1921	127,040[c]	142,749

(a) Red Bermuda 2,641 lbs,; Yellow, 30,786 lbs.; White, 9,923 lbs.

(b) Of these 1,083 lbs. went to Porto Rico.

(c) Of these 1,533 lbs. went to Porto Rico.

Seed Growers

Most of the seed crop is grown on contract by or for a comparatively few dealers, who sell to American seed firms or have their own agents in the States. In most cases of seed trade the consumer must depend very largely upon the reliability of the seed source and this is no less the case with the Canary onion seed. Careful selection of bulbs, proper segregation of varieties, honest labeling of seed are to be assumed only from houses with an established name; and these practices are bound to make the cost of production higher than that of the "casual buyer" who takes advantage of fluctuation in supply and demand without regard to the history and quality of the seed being handled. American users of Bermuda seed should recognize that seed from a reliable house, even though bought at a higher figure, is cheaper than seed coming through an unknown channel. There is undoubtedly a certain percentage of poorly selected bulbs planted, and I have in one case seen Yellow and White Bermuda seed growing on adjacent terraces with no attempt at isolation.

Bulb Production and Handling for Seed Growing

Most dealers grow or have grown the bulbs needed for the seed crop and distribute them to persons contracting to grow seed. It is essential for the production of reliable seed that such a practice be followed, since it is only by such methods that careful selection of bulbs can be carried on and a high-grade varietal purity be maintained. These bulbs are grown and harvested in essentially the same manner as described for the Lanzarote crop. They are then brought in in bunches to a central storage. Here they are sorted over and all bulbs having globe or bottleneck shape or off color are picked out and sold for table use. Any bulbs showing decay are also presumably discarded at this time. They are then stored by hanging the bunches upon the walls or rafters or by laying them upon the floor of the storage shed. This shed is exposed on at least one side and often the center court with a temporary roof is also used. At any rate the bulbs are protected from the sun and afforded all possible ventilation. This is very necessary, since they must be kept until October, during the hottest time of the year. One dealer, Mr. Varela, told me that he has better success by simply spreading the bulbs out upon the ground and protecting them from the sun with a canvas stretched two or three feet above them so as to afford plenty of ventilation.

While in storage the bulbs are picked over one or more times to remove decaying ones and are finally selected and sorted at planting time in October.

Handling of the Seed Crop

The seed crop is usually grown under irrigation, sometimes not. The system of planting is similar to that used in the United States. Planting of the bulbs is done in October and November.

Some of the seed is ripe by the middle of June. As soon as a very few of the seed carpels break open the entire umbel is picked and allowed to dry in the sun. Since all umbels do not ripen at once, each field is picked over several times. After the seed balls have dried out thoroughly they are thrashed by beating with a stick or flail upon a hard floor. (See fig. 16). The seed is then separated from the chaff by "hand sifting," which consists of shaking about in a broad shallow basket and allowing the wind to carry away the chaff and light seed. This is all done by the Spanish women, who become very dexterous at this operation.

The seed is grown at various points on the Island of Tenerife. The tendency at present is apparently for the industry to shift more to the south coast. This is probably due to better average yields resulting in the latter region. There appears to be less mildew on the south coast, and climatic conditions are probably largely responsible for differences between the two coasts. There are many plantings close to Santa Cruz, but the crop also occurs as far west as Anco on the south and Buena Vista on the north.

Shipping and Holding Over of Seed

Since practically all of the seed produced here is needed in August or early September for planting the Bermuda onion crop in Texas and other southern states, there can be little delay in shipping the seed as soon as it is cleaned. Dealers as a rule refuse to take seed after August 15, since this is the latest date at which shipment can be made to America for the current season's planting. The seed is all shipped in sealed tin boxes about 30 inches long, 15 inches wide, and 12 inches deep.

It is to be seen from the production figures that the supply varies greatly from year to year. This is due to various causes, such as variations in acreage planted, prevalence of disease, and seasonal conditions affecting the crop. It is consequently very often necessary to carry over a certain percentage of the crop. During the last season there was an over production and also over buying by American houses. Both facts are probably responsible for the reduction in demands reported at the opening of the 1922 shipping season.

It is well known that onion seed deteriorate very rapidly under ordinary conditions and that one-year-old seed is usually inferior to new seed. This leads to differences in disposing of the "carry-over," according to the methods and integrity of the dealer. In some cases it is held in cold storage in New York and sold the following season as new or as old seed. In other cases it is held in the Islands and thus disposed of. In either case there is no doubt that some practice ~~of~~ of mixing the old and new seed and selling it all as new seed.

The carrying over of onion seed for at least one season is almost necessary to counterbalance the variations in supply and demand. At present there is a serious discrimination against one-year-old seed. If proper conditions may be found whereby deterioration may be reduced to a minimum or eliminated for one year, it should be very useful to seed dealers and should help stabilize the onion-seed market.

Onion Diseases in the Canary Islands

Since these observations were made over only a ten-day period, (June 22 to July 1), at one season of the year, their limitations are necessarily obvious. Practically no work on plant diseases has ever been done on the Islands, and no especial attention is being given to them by any agency at the present time. I was assured by some growers and dealers that there was little or no disease on the Islands, but others were aware that such was not entirely the case. With the intensive system of agriculture which is being employed, one might almost assume that some diseases were to be found; and the fact that onions and onion seed have been produced intensively for 20 years or more on these small islands would also lead one to suppose that some diseases of this crop were present. As a matter of fact, during this short stay I was able to identify, with the exception of smut and Fusarium rot, every disease known on onions in America, and one or two not known in the United States. These observations were made at the time when the bulb crop was being or had already been harvested and as the seed crop was approaching maturity. It will be best to consider each disease separately.

Mildew (Peronospora schleideni)

This, with the black leaf mold (Macrosporium parasiticum) is the most common and conspicuous disease of onions in the Canaries, and consequently the better known. I saw it in some fields at Santa Cruz (June 23 to 27) and at Orotava (June 29), where it had caused a loss of at least 80 per cent and probably more of the crop. In other fields it was much less serious and still others were quite free from it. Taken as a whole I should say that it was generally serious, but in a few cases very destructive. It was quite evident to me that the location of the fields with respect to air drainage was a very important factor in the control of this disease. In fact, wherever I saw mildew in its severe form the fields were partially surrounded either by trees or buildings, so as to prevent the freest ventilation. At Buena Vista (June 29) and Guimar (June 30) practically no mildew was found and in these cases the fields were on areas sloping toward the sea and fully exposed. Mr. Reid at Orotava has tried spraying with Bordeaux to control this disease but without success. The rows of seed plants are set somewhat closer here than in America and the difficulty of applying the spray successfully is a strong argument against its use. In fact, I believe as much or more may be gained by selection of fields and localities as by spraying. I suspect this factor accounts in part for the tendency to grow more seed each year on the south coast.

Black Leaf Mold (Macrosporium parasiticum)

This is universally present following mildew and undoubtedly increases the damage started by the latter. It probably in some cases acts independently although to a minor degree; where mildew was absent little or no leaf mold was to be found.

Rust (Puccinia porri)

This disease was made most conspicuous by the formation of telia. These developed as small pin points, closely grouped together to form black spots, irregular in size and shape, on the green seed-stalk. As the stem died these spots remained equally as conspicuous. The sori, in cross section, showed the teliospores formed and closely packed together in the cells just beneath the outer epidermal cell layer. The latter, though slightly raised, was not ruptured and I believe does not rupture; the spores are probably dispersed after the death of the host or germinate *in situ*. The uredinia are present but not as conspicuous nor so abundant. They were seldom found to occur alone but usually with the telia. The uredinia are brown or orange in color and as they mature cause a longitudinal rupture of the host epidermis. Around these sori the telia are developed. At the time collections were made, June 24 to June 29, it was evident that uredospore formation was past and the teliospore formation had been in progress for some time. In most of the spots one uredinium was to be found in the center but it was closely surrounded and nearly obscured by the numerously crowded telia. In other cases several uredinia were found in the center of a spot, making the center light-gray with the orange uredinia and surrounded by black uredinia covering areas up to 5 mm. in diameter and surrounded by narrow black zones of telia.

This disease was found commonly in many fields; although it was in no case abundant. In the region about Santa Cruz it was found only in fields of the Crystal Wax variety, while Yellow Bermuda fields adjacent or near by were free from it. It was thought at first to be a case of varietal difference in susceptibility. This was probably only a coincidence, however, since later (June 29) at Buena Vista the disease was found prevalent on the yellow variety. It apparently causes no serious damage to the host plant. The identity of thissfungus remains for further study.

Pink Root (Fusarium malli ?)

This disease was to be found commonly in many of the seed fields without respect to location. There was no evidence of it in anything but a mild form, however, and it is not certain that it is the same as the Texas pink root. Mr. Reid tells me that there was much more pink root two seasons ago, and Mr. Wortley speaks of it in the report of his visit of that season. It was found common on bulbs from Lanzarote Island also.

Rotation of seed fields is practiced by some growers, though it is not known how much this is done generally. The bulbs, however, being infected may be the means of carrying it to clean fields.

Basal Rot of Seed Plants

This trouble is the most serious noted on the seed crop. In some cases 90 per cent of the crop was lost. In the vicinity of Santa Cruz the Crystal Wax variety suffered the most, but near Buena Vista fields of the Yellow Bermuda were also severely affected. The disease was so far advanced that it was impossible to tell very much about the cause. The plants die down completely sometimes before much of a stem develops and more often after the blossoming stage. When pulled, the stem comes up with no resistance and the base is completely rotted off and dried up, even suggesting that it had been chewed off by rodents. The bulb, which at this stage should be of considerable size and solid, has completely decayed and usually entirely disappeared. The base of these diseased stems gives some evidence of insect working, and very often Fusarium and Botrytis are found, but it is quite possible that all of these are secondary. In a field of Yellow Bermuda at Buena Vista mostly destroyed by this type of trouble, some cases of what appears to be an earlier stage were found. (June 29). In these cases the bulbs were only partially decayed and the base of the seed stem still intact. Such bulbs were affected with bacterial soft rot. It is quite possible that most of this trouble is due to the soft-rot decay laying hold of the bulbs in midseason or later. Several of the men told me that they always had more or less of this disease causing losses during the storage period. It is necessary to follow this trouble through the season in order to tell much more about it; and it is not unthinkable that it might be traced to incipient soft rot in the bulbs before planting.

White Rot (Sclerotium cepivorum)

Two cases of this disease were found, one in Crystal Wax Bermuda just brought from the field to Mr. Reid's storage at Orotava; the other was found on the same variety under the same conditions in Mr. Wildpret's storage at Orotava. From what we know of this disease in Europe it is most common in midseason and causes the death of affected plants before harvest. Doctor Cotton states that one sees very little of it on onions in England after July. It is thus quite possible that if the fields where these infected bulbs grew were examined one or two months ago, the disease would have been found in greater abundance. Mr. Varola at Santa Cruz later told me that they often had much white rot in the bulb crop earlier in the season. It is thus no doubt prevalent to no small degree.

An important question is that of the possibility of its being carried with the seed. The chances for dissemination in such manner are not very great, although the contamination of seed through some irregular channel is not impossible. It is evident that even in cases of heavy infection in the field, few diseased bulbs reach storage. Any infected bulbs which do go thus far would decay during the warm storage period of four months, at least to such an extent that they would be thrown out as sorted before planting. However, quite healthy bulbs might carry sclerotia or infected soil to the seed field.

The disease was not found in any seed fields. In case of seed plant infection by the last possibility, the chances of the fungus contaminating the seed are not great, but of course it is not impossible. I should say the chances of seed contamination by means of Sclerotium cepivorum are quite comparable to the case of onion smut.

Smudge (Colletotrichum circinans)

Very little of this disease was found on bulbs of seed plants. On the Crystal Wax bulbs which had just been harvested, however, it was very general and in some cases very abundant. In Mr. Wildpret's storage I found in some bulbs which were only recently pulled, cases where the fungus had rapidly invaded the fleshy scales, causing much depressed lesions up to a centimeter in diameter. Mr. Wildpret says he often has considerable shrinkage in storage due to this disease. I have never seen this fungus so active on White Globe onions.

Neck Rot (Botrytis allii)

This disease though not abundant was found to occur. It was noted (June 23) on Red Bermuda bulbs recently harvested and brought from Lanzarote Island to Santa Cruz. Infection in this case had taken place through a wound on the side of the bulb. A second case was noted on Crystal Wax variety, recently harvested, at Wildpret storage, Orotava (June 30). This case was neck infection.

Soft Rot (Bacillus sp.)

A few incipient cases of what appeared to be soft rot starting at the neck and affecting outer bulbs were noted on recently harvested Lanzarote Red Bermuda onions at Santa Cruz. The occurrence of soft rot on bulbs in the seed field has already been noted.

Yellow Rot (Macrosporium sp.)

One specimen collected from a lot of Red Bermuda onions, Lanzarote, June 23.

Black Mold (Aspergillus niger)

A slight amount was found on Lanzarote Red Bermuda onions, recently harvested (June 23). The weather was clear and dry as usually is the case at this season, which fact would not lead one to expect any large amount of black mold or neck rot.

Fusarium Rot

No cases of Fusarium bulb rot were noted.

Acknowledgements

I am greatly indebted to Consul Henry and Vice-Consul Phelan, Santa de Cruz de Tenerife, who have very kindly placed much data in their office at my disposal, introduced me to commercial men concerned in the subject, and accompanied me on field excursions. Only through the help and commendable spirit of cooperation of these men was the visit to Tenerife made successful.

DISEASES OF FRUIT AND NUT CROPS IN THE UNITED STATES IN 1923

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Introduction

The present summary on the diseases of fruits and nut crops in the United States for 1923 is based upon the records supplied by the numerous collaborators working in the several states and upon the recent publications on the diseases of these crops. It cannot be considered as being inclusive for reasons which appear later in this introduction. Nearly half of the information available for preparing this summary had to do with the diseases of the apple. This does not mean that the apple crop is of any such relative importance when compared with all other fruit and nut crops but rather that the apple is more widely grown than any other crop coming within the scope of this summary, and further that it is of sufficient importance in practically every part of the United States to engage the interest of observers as well as investigators. From the standpoint of the monetary value of these other crops it seems unfortunate that more information is not available regarding their diseases, which, in most cases, are of great importance in the production of quality fruit. Another reason why crops other than the apple are not given more consideration in this summary is because a considerable number of these crops are grown in regions where the Plant Disease Survey Collaborators are generally inactive in sending in reports on the conditions in their territory. Practically all of the reports in 1923 came from the eastern half of the United States while only a few scattering reports came from the remainder of the country. From the great fruit producing state of California a very meager amount of information was available. The Plant Disease Survey can never hope to carry out its purposes in a fully creditable way until full cooperation from the collaborators in each state is secured.

The Disease Situation in General

A few general remarks may be made regarding the fruit disease situation in 1923. Of the important apple diseases, scab, blotch, cedar rust, and frog-eye were of less importance than in 1922, chiefly for the reason that infection in the case of each of these diseases takes place early in the season and is dependent at that time upon rainfall to a great extent. With a few exceptional areas the rainfall was deficient at the critical period for infection. A study of the departure from the normal rainfall for April to June as shown in the following table indicates a general relationship between the areas where rainfall was deficient and where fungous diseases like scab, cedar rust, etc, were of lesser importance.

Bitter rot and fire blight were both more serious than in 1922. The former develops late in the season and was favored by the late rainfalls in the important bitter rot areas, and the latter is dependent upon quite a different set of conditions than those affecting the fungous diseases, even though primary infection takes place during the blossoming period. It is interesting to note that fire blight was probably near the crest of the high wave of this disease in 1923. It should be watched closely in 1924 to determine whether it will subside or not.

In the case of peach diseases the same general situation existed. Brown rot and scab were of less importance than in 1922 apparently because of conditions similar to those affecting scab and similar diseases of the apple. On the other hand leaf curl was more severe in most sections owing to the prevalence of rain during the very early spring, and the consequent difficulty of getting spray rigs into the orchards.

Frost injury to fruit trees was severe in 1923 but probably of less general importance than in 1922.

New or Noteworthy diseases of 1923 (See general part of report for more specific data).

Apple - An infectious mosaic-like disease of apple was found in New York. Silver leaf caused by *Stereum purpureum* was reported in Washington.

Pear - Sooty blotch caused by *Phyllachora pomigena* was reported for the first time from Illinois.

Peach - Powdery mildew caused by *Sphaerotheca pannosa* was reported for the first time from Illinois.
Bud rot caused by *Fusarium gemmiperda* was reported from Georgia by Roberts.

Cherry - A canker on Montmorency cherry, following winter-injury to twigs, caused by *Phomopsis padina* (Sacc.) Died. was reported from Red Creek, New York.

Apricot - Black heart, caused by *Verticillium* sp. was reported from California.

Grape - Rust caused by *Physopella vitis* was reported as found in California for the first time.

Currant - Leaf spot caused by *Cercospora angulata*, Kansas.

Gooseberry - Powdery mildew caused *Sphaerotheca mors-uvae*, Colorado.
Leaf spot caused by *Septoria ribis*, Kansas.
Cane blight, caused by *Leptosphaeria coniothyrium*, Missouri.
Rosette, cause undetermined, Delaware.

Lemon - Brown rot caused by *Pythiacystis citrophthora* from a greenhouse in New Jersey.

Suggestions regarding special needs of the Survey

The greatest need is for more complete returns on plant diseases, especially from the western half of the United States. More complete data are also needed from all states regarding losses, with explanatory notes, especially when such losses are phenomenally high; more data on frost and drouth injury; more data from most states on the relative resistance of crop plants to disease. Attention is called to the information presented regarding the reaction of varietal groups of apple to cedar rust. Similar compilations should be made for several diseases.

Table 1. Departure from the normal temperature and rainfall by states - April to September, 1923
(Figures taken from United States Department of Agriculture Monthly Weather Review 10: 1923.)

State	Departure from normal											
	Temperature (°F)						Precipitation (inches)					
	April	May	June	July	August	September	April	May	June	July	August	September
New Eng.	-0.2	-1.0	+1.4	-2.6	-1.5	+1.9	+1.97	-1.58	-0.41	-0.58	-1.64	-1.20
N. Y.	-1.0	-2.8	+1.7	-2.1	-1.7	+0.8	-0.40	-0.88	+0.03	-1.17	-1.69	+0.13
N. J.	+0.5	-1.3	+3.8	-1.9	-1.2	+1.3	-0.10	-2.08	-1.70	-0.68	-2.30	+0.18
Pa.	-0.4	-1.7	+3.3	-1.0	-0.8	+1.2	-0.57	-0.37	-1.76	-0.09	-1.41	+0.32
Del.-Md	-0.8	-1.7	+3.1	-1.3	-0.6	+1.2	+0.82	-1.70	-1.11	+0.27	-1.34	+0.31
Va.	-0.5	-2.1	+2.7	-1.1	-0.5	+0.8	+0.23	-2.00	-1.69	+0.58	+0.44	+0.80
N. C.	-0.5	-2.0	+1.6	-0.5	+0.7	+1.7	+0.61	+0.20	-2.72	-0.63	-1.12	+0.16
S. C.	-0.9	-3.1	-0.4	-0.8	+0.5	+1.2	+0.50	+2.78	-2.52	-1.44	+1.35	-1.15
Ga.	+0.3	-2.9	-1.6	-1.3	+0.4	+1.5	+0.36	+5.40	+0.60	-1.37	+0.11	-1.70
Fla.	+1.8	-1.6	-0.7	-0.7	0.0	+0.4	-0.37	+5.35	+2.36	-0.19	-0.56	-1.89
Ala	+0.2	-2.0	-1.1	-1.4	-0.6	+1.1	+1.45	+4.54	-0.18	-0.59	+1.56	-2.17
Miss.	+0.1	-1.6	-0.9	-1.4	-0.2	+0.4	+3.12	+4.63	+0.99	+0.55	+1.07	-1.19
La.	+1.0	-1.3	-0.6	-1.4	0.0	+0.1	+1.52	+3.67	+1.68	+0.56	+0.36	+1.24
Texas	+0.1	+1.0	+0.8	+0.6	+1.2	+0.8	+0.94	-1.71	-0.23	-1.06	-0.29	+1.79
Tenn.	-0.9	-2.1	-0.2	-0.3	+0.1	+0.4	+0.55	+2.34	-0.19	-0.68	+2.06	-0.36
Ky.	-1.1	-1.7	+0.1	+0.1	-0.3	-0.2	+0.94	+0.03	+0.41	-0.71	+2.47	+0.11
W. Va.	-1.2	-2.2	+1.3	-1.2	-0.7	+0.8	-0.10	-1.30	+0.27	+0.12	+0.52	+0.40
Ohio	-1.4	-2.4	+1.9	-0.8	-1.1	+0.3	-0.58	+0.04	-0.50	+0.35	+0.83	+0.62
Ind.	-2.7	-1.4	+1.0	-0.2	-0.5	+0.3	-1.00	+1.03	-0.39	+0.06	+1.55	+0.40
Ill.	-0.6	-1.8	+1.7	+1.2	-0.1	-0.4	-1.02	+0.10	-0.35	-1.37	+1.57	+0.47
Mich.	-2.2	-1.5	+3.5	+0.2	-1.9	+0.2	-0.45	-0.29	-0.50	+0.25	-0.18	+0.24
Wis.	-2.3	+0.1	+4.0	+2.0	-1.7	+0.2	-0.27	-1.91	+0.64	-0.53	-0.42	-0.28
Minn.	-2.2	+1.2	+3.9	+3.6	-1.9	+2.4	-0.29	-1.40	+0.58	-0.77	-0.84	-0.49
Iowa	-0.3	-0.9	+1.8	+2.4	-1.2	+0.8	-0.77	-1.73	+0.55	-2.21	+1.74	+2.43
Mo.	-0.6	-1.9	+0.2	+0.7	+1.3	+0.3	-0.74	-0.49	+1.02	-0.89	+0.31	+0.86

State	Departure from normal											
	Temperature (^{o}F)						Precipitation (inches)					
	April	May	June	July	August	September	April	May	June	July	August	September
Ark.	+0.2	-2.0	-0.1	0.0	+2.5	-0.9	+1.52	+3.12	+1.12	-0.39	-1.40	+2.23
N. D.	-3.0	+1.5	+3.3	+3.7	-2.4	+3.7	+0.07	-0.78	+0.32	+0.53	+0.38	+0.75
S. D.	-0.9	+0.6	+1.7	+3.6	-1.8	+1.8	-0.17	-0.67	+1.20	+0.15	+0.82	+1.37
Nebr.	-0.7	-1.6	0.0	+1.9	-1.8	+0.4	+0.02	+1.37	+0.92	-0.59	+1.95	+1.56
Kans.	+0.7	-2.0	-0.1	+0.3	+0.8	+0.1	-0.15	+1.96	+2.15	-0.31	-0.65	+1.40
Okla.	+0.5	-0.7	+0.7	+2.3	+3.0	+0.2	+0.84	+1.58	+0.87	-1.82	-1.55	+4.21
Mont.	-0.6	+0.5	-0.2	+3.5	-0.7	+2.1	+0.01	-0.22	+1.29	+0.75	+0.50	+0.02
Wyo.	-1.9	+1.1	-0.6	+2.7	-0.9	+0.1	+0.09	-0.01	+0.51	+1.06	+0.55	+2.17
Colo.	-0.7	+0.2	-0.8	+1.1	-1.5	-2.1	-0.58	+0.36	+0.85	+0.85	+1.38	+0.27
N. Mex.	+0.1	+0.9	+0.2	+0.8	-0.9	-1.8	+0.13	-0.53	+0.02	-0.70	+1.73	+0.29
Ariz.	-1.0	+2.7	-3.2	-0.2	-1.7	-2.8	-0.10	-0.11	-0.31	+0.28	+0.59	+0.39
Utah	-1.9	+1.6	-3.4	+1.6	-1.3	-0.9	+0.80	-0.08	-0.08	+0.23	+0.20	-0.08
Nev.	-1.3	+1.4	-5.1	+1.1	-1.5	+0.6	+0.42	+0.21	+0.79	+0.09	+0.14	+0.48
Idaho	-1.0	+0.4	-2.1	+2.0	-0.2	+2.6	+0.56	+0.11	+1.40	0.19	+0.21	-0.33
Wash.	+1.3	+0.4	-0.3	+1.4	+1.9	+2.6	-0.54	-0.19	+0.48	+0.46	+0.35	-0.69
Oreg.	+0.7	+0.8	-1.1	+0.9	+1.5	+2.7	-0.08	-0.07	+0.47	+0.59	-0.07	-0.54
Cal.	-2.4	+0.1	-5.4	-1.8	-1.4	+2.0	+2.38	-0.74	+0.29	-0.03	+0.03	+0.67

FRUIT DISEASES OF 1923

DISEASES OF POME FRUITS

APPLE

Scab caused by Venturia inaequalis (Cke.) Wint.

Geographical distribution

Apple scab was widely distributed as usual, being reported from all of the principal apple producing areas. The severe infection of 1921 and 1922 led plant pathologists to predict another epiphytotic for 1923, but the reports from a majority of the states do not indicate any increase in scab except in very restricted areas such as southern Delaware and possibly southern Ohio. Kansas and Idaho report scab as being about as prevalent as in 1922. Maine, New Hampshire, Connecticut, Pennsylvania, Kentucky, Indiana and Washington report the disease as being of average prevalence. All the remaining states sending reports indicate scab as being of less importance than usual. Summing up the situation it may be said that apple scab in 1923 was generally less severe than usual and that where timely applications of fungicides were made there was little difficulty in securing excellent control.

Economic importance of and losses from apple scab.

Revised estimates of damage in percentages and bushels will be given in a later supplement.

Table 2: Losses caused by apple scab in 1923 as estimated by state collaborators.

Percentage reduction in yield	State
8	North Carolina
7	Iowa
6	Ohio
5	Vermont, New York
4	Indiana, Alabama
3.5	Illinois
3	Connecticut, Delaware, Virginia Minnesota
2	Wisconsin
1.5	Kansas
1	New Hampshire, Massachusetts, West Virginia, South Carolina, Michigan, North Dakota
0.5	Arkansas, Idaho

Ascospore discharge

Studies on ascospore discharge were carried out in several states. The following (table 3) shows the dates of ascospore discharge as reported by various collaborators, together with the dates of bud development, so far as such data are given in the reports:

Table 3 Ascospore discharge in 1923

Place	Duration of period	Optimum periods for ascospore discharge
Seaford, Del.	Mar. 28-May 29	April 4, 14-17, May 8
Woodside, Del.	Apr. 15-May 21	Apr. 15,28, May 9,13,21
Littleton, Mass.	May 1 -June 14	May 12, 21.
Wayne Co., N. Y.	Apr. 30-June 26	May 18-19, June 3-8
Genesee Co., N. Y.	----------------	May 18-19, June 3-4
Adams Co., Pa.	Apr. 14-June 21	Apr. 24
Winchester, Va.	Apr. 28-July 30	May 11, 15, 20, June 11
Columbus, Ohio	Apr. 4 -June 8	May 8-21

Table 4 Dates of apple bud development 1923

Place	Delayed Dormant	Prepink*	Pink*	Petal Fall*
Seaford, Del.	Mar. 30 (Stayman)	Apr. 5-11 (Two var)	Apr. 10, 16 (Two var.)	Apr.30,May 5,6 (Three var.)
Woodside, Del.	Apr. 5	-----------	Apr. 16	Apr.30,May 5
Littleton, Mass.	Apr. 30	May 7-10	------------	May 21-24
Wayne Co. N. Y.	Apr.30- May 2	May 12	May 21	May 25
Genesee Co. N. Y.	Apr. 30	May 4	May 17	June 4
Adams Co., Pa.	Apr. 18 - 19	Apr 25-26	Apr.30-May 2	May 11-12
Winchester, Va.	Apr. 1 - 4	----------	Apr 23 - 25	May 5-8
Columbus, Ohio	Middle Apr.	----------	------------	------------

* Note: The prepink dates were for Early Ripe and Transparent; pink dates for Early Ripe and Stayman; petal-fall dates for Early Ripe, Transparent and Stayman.

J. F. Adams reports that ascospore discharge at Seaford began two days before the date of the delayed dormant application and that very little discharge took place after May 8, which was just following the petal-fall applications. At Woodside, Delaware, the first ascospore expulsion did not occur until April 15, which practically coincided with the time of the pink application.

In general, however, these data show a progressive ascospore expulsion coinciding with geographical seasonal development; the earliest "first discharge date" being at Seaford, Delaware, and the latest "first discharge date" at Littleton, Massachusetts.

"The ascospore discharge period as noted in this table covers a period of over 90 days which I believe is the longest on record anywhere. The lack of rain in May very likely prolonged this discharge period and I am quite positive that this absence of normal rainfall (1923, rainfall 1-1/10 inches--normal rainfall for the 8-year period, 4-1/10 inches), during the past sping was the most important single factor in determining a very light scab epidemic. The check trees in our experimental plats were infected only to the extent of 3% as compared with 100% last year. The initial infection very likely occurred in the period of April 28 to May 15, inclusive. The first scab appearance noted was on May 16 which would indicate that the first ascospore discharge which occurred April 28 was probably the cause of initial infection. Our data for the past few years demonstrates quite clearly that early spring infection is the important factor of scab epidemics. Infection after the 2-week's spray does not amount to very much with us and we feel that we can check most any scab epidemic by timely and proper application of the pink, the calyx, and the 2-week's spray." (Schneiderhan, Virginia)

Stover and Johnson (4) at Columbus, Ohio, and Anderson at Urbana, Illinois, report ascospore discharge two weeks before the period for the delayed dormant. It is evident in general that ascospore discharge in 1923 usually extended over a wider period than that of the dates of the first four or five applications, using the delayed dormant as the first date. From the results at Woodside, Delaware, it is also evident that exceptions may occur and that in some seasons the period of ascospore expulsion is likely to be very short. Probably there are wide differences in the amount of viable perithecial material present in different regions, as Clinton states that in Connecticut the ascospore stage was only moderately abundant and White in Kansas reports few perithecia in the overwintered leaves.

Comparing the data with that presented in Supplement 28 for 1922, (page 277) it is apparent that the correlation of first dates of ascospore discharge are fairly close but that the season for expulsion was in general longer in 1923 than in 1922.

Dates of earliest appearance of infection in 1923

Unfortunately the reports on earliest appearance of the apple scab are not generally accompanied with data concerning the stage of growth of the leaves or the stages of bud development, which would indicate the relative importance of the various sprays. Anderson in Illinois reports that scab appeared in that state on fruit as early as on foliage.

It is apparent that little correlation exists between the earliest dates of ascospore discharge and the appearance of first infection on foliage or fruit as shown by these reports. Collaborators are urged to increase the value of these data by furnishing the necessary supplemental information.

APPLE - Scab

Table 5. Dates of earliest recorded appearance of apple scab in 1923.

Date	Location	Date	Location
May 2	Franklin Co., Pa.	May 20	Central Iowa
" 7	Delaware	" 21	Ramsey Co., Minn.
" 10	Wisconsin	" 22	Columbus, Ohio
" 15	Michigan	" 23	Grafton, Ill.
" 16	Winchester, Va.	" 24	Olney, Ill.
" 16	Duchess Co. N. Y.	" 27	Urbana, Ill.
" 16	Hammonton, N. J.	" 29	Lafayette, Ind.
" 16	Littleton, Mass.	June 4	Greenland, N. H.
" 18	Highwood, Conn.		
" 18	Hollins, Va.		

Weather relations

In the New England states, eastern New York, Pennsylvania, Maryland, Virginia, West Virginia and the Southeast, the weather conditions were generally favorable only for the primary infection and were not such as to interefere in general with the timely application of sprays. In southern Delaware the conditions were very favorable for heavy and continued scab infection, resulting in one of the most severe epiphytotics experienced in that section.

Scab was also severe in portions of western New York, southern Ohio, Kentucky, and parts of Indiana and Illinois. It appears that these scab infections of 1923 were local in distribution and much scattered, corresponding in general with the localized precipitation and temperature recorded for the country from April to midsummer. In many states collaborators reported that the dry weather following the "petal fall," or "two weeks after petal fall" applications, effectively checked secondary infections.

Varietal susceptibility

McIntosh was again reported as being most susceptible in Massachusetts and Connecticut.

Adams reports severe infection on leaves, fruit, pedicels and sepals of Maiden Blush, Winesap, Nero and Paragon in Sussex County, Delaware. Fruit infection was prevalent also on Delicious, York Imperial, Lilly, Stayman, Red Astrachan, Grimes Golden, Gravenstein, Williams Early Red, Rome Beauty and Yellow Transparent. Early Ripe dropped leaves badly from scab in early June.

Hurt from Virginia reports the following comparative scab infection in 33 orchards (14 of Winesap, 12 of Albemarle Pippin, 3 of York Imperial, 3 of Ben Davis and 1 Stayman.)

Table 6. Percentage of scab infection in orchards at Crozet, Virginia. 1923.

Variety	Percentage orchards showing infection	Maximum percentage infection	Average percentage infection.
Winesap	86	2.6	0.7
Pippin	8	t	t
York	33	---?	---?
Ben Davis	100	1.0	0.3
Stayman	--	---	0.5
All varieties	45	2.6	0.9

Gardner in Indiana reports scab as being particularly severe on Delicious, Winter Banana, Ben Davis, Fameuse, Red June, Rome, and Moyer, while York Imperial, Grimes Golden, and Transparent show considerable resistance. Gardner also noted scab on fruit of Mann, Wealthy, Maiden Blush, Rambo, Northern Spy, Winesap, Northwestern Greening, Jonathan and Esopus.

In Wisconsin, Vaughan reports that Dudley showed 90 percent infection while Wealthy, McIntosh, Duchess, Snow, and Lubsk Queen showed only 50 percent under comparable conditions.

In Minnesota the crab varieties and Wealthy are said to be generally infected while the Greening showed some resistance. It should be noted that Wealthy is generally regarded as highly resistant in the East.

Messrs. Kirby and Honey of Cornell report the following cultivated and ornamental crabs as being moderately susceptible to apple scab: - *Malus cashmeriana, M. coronaria, M. cordata, M. floribunda, M. platycarpa, M. prunifolia, M. ques, M. scheideckeri* and *M. soulardi.* Those showing a trace of infection are *M. flava, M. ioensis, M. transcendens.* Bechtel's crab was reported by them as being so susceptible that necrotic areas were produced in the leaf.

The following table presents data on the comparative susceptibility of apple varieties arranged according to the group classification of Hedrick and Howe (New York (Geneva) Agr. Exp. Sta. Bul. 361: 79-135. 1913). A similar list is given for cedar rust and the discussion there (p.64) of the reasons for the varying reports regarding certain varieties (e.g., Ben Davis) or certain groups, will, for the most part, apply here equally well. However, in the case of scab, neither varietal susceptibility nor group susceptibility seems to be as well-marked as with cedar rust. It will be noted, nevertheless, that there is a striking unanimity of opinion regarding the susceptibility of varieties included in some groups, for instance the Fameuse group, number 8, and the Winesap group, number 34.

Table 7. Comparative susceptibility of groups of apple varieties to apple scab.

Group number	Variety	Relative susceptibility and reporter			
		Very resistant	Resistant	Susceptible	Very susceptible
1 Aport	Alexander		H & H,M		
	Bietigheimer	Sy			
	McMahon			(Vn)	
	Wolf River	Sy		M	

APPLE - Scab (varietal susceptibility)

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
2 Baldwin	Babbit		Sy		
	Baldwin	Sy, (Cl), (Ch), (Bu)	M	(O)	
	Sutton		Sy, H&H		
3 Ben Davis	Beach			(V&M)	
	Ben Davis	Sy	H&H	M	(F), (P), (M), (O), (Gs), (An)
	Collins				(H)
Gano		Sy	M, H&H		(F), (O)
4 Black Gilliflower	Black Gilliflower		H&H		
5 Blue Pearmain	Baxter		H&H		
	Blue Pearmain				M
	White Pearmain				M
	Windsor	(Vn)			
6 Chenango	Chenango			H&H	
7 Early Harvest	Early Harvest				M, Sy
8 Fameuse	Fameuse				H&H, (Ga), (J.) (L), M, (Os), (P) (Vn)
	McIntosh				H&H, M, (B), (Ch), (Cl), (An), (Mo), (Os), Sy, (Th)
	St. Lawrence				H&H
	Shiawassee				M
10 Jonathan	Esopus			M, H&H	
	Jonathan		Sy, H&H (Vn)	M, (P), (O), (H)	
	King David		Sy		
	Mother			H&H	
	Red Canada			M, Sy, H&H	
12 Lady	Lady			H&H, D	
13 Lawver	Akin			M	
	Lawver			D	H&H, M, (F) (Gs)

APPLE - Scab (varietal susceptibility)

Group number and name	Variety	Relative susceptibility and reporter			
		Very resistant	Resistant	Susceptible	Very susceptible
14 Limbertwig	Limbertwig				D
16 Livland Raspberry	Livland Raspberry		M		
18 Northern Spy	Northern Spy			M, H&H	Sy
	Wagener	M	Sy, H&H		
19 Oldenburg	Oldenburg (Duchess)	M, (P), (Ch)	Sy, H&H	(T)	
	Pewaukee			M	
19a Gravenstein	Gravenstein		M, H&H	Sy, (Cl)	
20 Ralls	Ingram		Sy		
	Ralls				Sy
	Salome		Sy	(Ga)	
21 Rambo	Domine				D
	Rambo				Sy
22 Red Astrachan	Red Astrachan		H&H, (Cl)	M	Sy, D
23 - Reinette:					
23a Fall Pippin	Banana			Sy, (O)	
	Boiken	Sy			
	Fall Pippin			H&H, (Cl)	
	Golden Pippin			H&H	
	Greenville		Sy		
	Hawley			H&H	
	Lowell		Sy		
	Maiden Blush		(E), (V&M)		
23b Rhode Island Greening	Greening	(St)			
	Monmouth			M	
	Northwestern Greening		M, H&H		Sy
	Patten Greening				(T)
	Rhode Island Greening		Sy	M, H&H	
23c Newtown	Belmont			H&H	Sy
	Green Newtown			H&H	
	Grimes Golden	M(O) (F) (Ga) (H)	Sy, H&H (P)(V&M)		
	Huntsman			H&H	
	(Newtown Pippin)				Sy
	Peck Pleasant				M
	White Pippin			Sy	

APPLE - Scab (varietal susceptibility)

Group number and name	Variety	Relative susceptibility and reporter			
		Very resistant	Resistant	Susceptible	Very susceptible
23d Swaar	Mann		Sy		
	Swaar		H&H		
24 Romanite	Minkler	Sy	M		
	Romanite			(Rd)	
	Stark			Sy, (O)	
	York Imperial	(N)(O)(F) (Ga)(H)M		Sy, (V&M)	
25 Rome Beauty	Langford	Sy			
	Rome Beauty		H&H	M	(K)(G)(O) (Gs)(An) (Ga)(Th) Sy
26 Russet	Roxbury Russet	Sy	H&H		
	Russet	(L)(O)			
27 Summer Rambo	Summer Rambo			Sy	
28 Sweet Bough	Sweet Bough	Sy			
29 Tetofsky	Tetofsky		M		
30 Tompkins King	Ensee			Sy	
	Hubbardston	M	Sy, H&H		
	Tompkins King		M, Sy, H&H	(O)(Ch)	
31 Twenty Ounce	Twenty Ounce			H&H	
33 Wealthy	Wealthy	M, Sy	H&H	(P)(Vn)	(T)
34 Winesap	Arkansas				M, Sy
	Arkansas Black			M, D	Sy(N)(Rd)
	Kinnard				D(An)(H)
	Mammoth Black Twig				(H)
	Oliver (Senator)		Sy		(H)
	Paragon				(F)(H)
	Stayman			Sy	(O)(V&M)
	Winesap	(H)(Vn)		D	Sy(N)(R)(O) (Rd)(V&M) (Ga)(H)
35 Yellow Bellflower	Moyer			(Ga)	
	Ortley			H&H	
	Yellow Bellflower		Sy	M, H&H	

Group number and name	Variety	Relative susceptibility and reporter			
		Very resistant	Resistant	Susceptible	Very susceptible
36 Yellow Transparent	Yellow Transparent	(Ga)(H)	M, H&H, (O) (V&M)		Sy

D - G. M. Darrow, U. S. Dept. Agr. Bul. 1189. 1923
H&H - U. P. Hedrick and G. H. Howe, New York (Geneva) Agr. Exp. Sta. Bul. 361: 79-135. 1913.
M - H. E. Morris, Montana Agr. Exp. Sta. Bul. 840. 1914
Sy - A. D. Selby, Ohio Agr. Exp. Sta. Bul. 290. 1915

An - H. W. Anderson, Illinois
B - Charles Brooks, New Hampshire
Bu - O. Butler, New Hampshire
Ch - Charles Chupp, New York
Cl - G. P. Clinton, Connecticut
E - J. A. Elliott, Arkansas
F - H. R. Fulton, North Carolina
G - H. Garman, Kentucky
Ga - M. W. Gardner, Indiana
Gs - N. J. Giddings, West Virginia
H - L. R. Hesler, Tennessee
J - L. R. Jones, Wisconsin
K - F. D. Kern, Indiana
L - B. F. Lutman, Vermont
Mo - W. J. Morse, Maine
N - J. B. S. Norton, Maryland
O - C. R. Orton, Pennsylvania
Os - A. V. Osmun, Massachusetts
P - L. H. Pammel, Iowa
R - H. S. Reed, Virginia
Rd - G. M. Reed, Missouri
St - E. C. Stakman, Minnesota
T - A. G. Tolaas, Minnesota
Th - R. C. Thomas, Ohio
V&M - W. D. Valleau & W. W. Magill, Ky.
Vn - R. E. Vaughan, Wisconsin

() - data from report in Plant Disease Survey files

Control

The important features of the reports on the control of apple scab in 1923 were:

(1) The value of the delayed dormant and pre-pink applications in particular;
(2) The success of the spraying program in general;
(3) The general effectiveness of dusts where scab is not in epiphytotic form.

Massachusetts: Both spraying with lime-sulfur and dusting with sulfur have been successful in experimental orchards. (Osmun) Krout (2) reports that dusting sulfur and copper-lime-arsenate were compared in 1922 and that the results were in favor of the sulfur dust. The most successful results obtained in two years were when a 3-10-50 Bordeaux mixture was substituted for lime-sulfur at time of the delayed dormant.

Connecticut: Good spraying effective. (Clinton)

APPLE - Scab (control)

New York: Spray service was organized for twelve counties with special plant pathological assistants in charge. Special attention was given to bud development, insect development, and weather forecasts in making out the schedule for each spray. In western New York the growers who applied sprays May 18-19 (pink or pre-pink) and June 3-4 (petal fall) had good control. Dusts did not generally show up as well as the sprays. Scab in general appeared to be less severe in the Hudson Valley and spraying was very generally effective there.

Pennsylvania: Scab more severe in western part of state where thorough spraying is not so generally practiced. Pre-pink and pink applications generally most important ones. Excellent control in orchards where full schedule was followed. (Thurston & McCubbin)

Delaware: Apple scab was particularly destructive this season because of serious infection on the stems of the young fruit which caused them to drop. The primary infection of the fruit was the most serious stage of the disease as most growers held the disease in check during the later part of the growing season. (Adams)

Maryland: Infection most severe in lower counties. In three counties it appeared in the twigs. A pre-pink lime-sulfur spray was the determining factor in control of scab in one case at least. (Temple & Jehle.)

Virginia: Stearns and Hough (3) listed Kayso and Magnet Dry Paste added to spray mixtures in comparison with spray mixtures without such additions. Neither of these materials increased the effectiveness of the spray solution in protecting the foliage and fruit from insects and diseases.

Kentucky: In two counties a pre-pink was applied with poor results. (W. W. Magill.)

Alabama: Important only in unsprayed orchards. (Miles.)

Arkansas: Slight in sprayed orchards. (Dept. Plant Pathology.)

Ohio: Excellent control in northern Ohio. Unfavorable weather prevented pink application in southern Ohio, resulting in much loss. (Thomas.)

Liquid lime-sulfur and Bordeaux Mixture gave satisfactory control. Foliage injury occurred where Bordeaux was applied after the bloom. Fair control secured where trees were sprayed with lime-sulfur before bloom and dusted with sulfur after bloom. Lime-sulfur followed by copper-arsenic dust failed to give commercial control. Sulfur dust alone also failed to give satisfactory control. The pink spray was the most important single one for the year. The pre-pink was of practically no value because of weather conditions unfavorable for infection prior to the time of pink spray. (Stover & Johnson (4).

Indiana: Sprays gave good control. Pre-pink necessary. (Gardner.)

Illinois: Easily controlled in eastern and central Illinois, but not in western Illinois. (Anderson.)

Wisconsin: Organized 70 farm orchard spray rings of 8 - 12 growers each, in addition to spraying demonstrations in commercial orchards. Sprays and dusts gave satisfactory control. (Vaughan)

Keitt and Jones (1) report that sepal infection bears a very important relation to seasonal development and control of apple scab. The sepals may be infected many days prior to the pink spray stage. The sepal infection is also established where the fungus is in a most favorable position for early secondary infection. A well timed pre-pink application has given most satisfactory control.

Kansas: Excellent control in sprayed orchards. (White)

Recent literature:

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4. Stover, W. G. and H. W. Johnson. First progress report on the study of apple scab under Ohio conditions. (Abstract) Phytopath. 14: 60. Jan. 1924.

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Anon. Spraying experiments. Ohio Agr. Exp. Sta. Bul. 362: 28-29. 1922. (Part of work of Ballou and Lewis)

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Blotch caused by Phyllosticta solitaria Ell. & Ev.

Geographical distribution:

The distribution of apple blotch in 1923 appears to coincide rather closely with the distribution as shown in Supplement 14 (Fig. 2, p. 13, 1920) although it was not reported from Nebraska and South Dakota as indicated in that map. In general the distribution of blotch may be indicated as a triangle on the map with Pennsylvania and New Jersey at the northeast, Texas at the southwest, and Nebraska and South Dakota at the northwest. The northern face of the triangle follows rather closely the forty-second parallel. The apparent restriction in 1923 was most probably due to the incompleteness of the reports, since during the history of the disease there has been no record of its disappearance from any locality once it has become fully established. The fungus is most persistent and there is every evidence in the records to show that it has been spreading slowly but surely in all directions since its first discovery on cultivated apples in 1897.

Economic importance and losses:

This disease appears to be the most serious disease year after year in the lower Ohio, Missouri, and lower Mississippi Valley apple sections, and districts lying to the southward of these areas. The chief reason for its persistence and annual severity appears to be its adaptation to overwintering in the bark cankers on living wood. These overwintering areas are always a source of infection and rarely fail to initiate the disease on leaf petioles and fruit. In 1923 the loss in Kentucky was said to be very heavy. Alabama and Kansas report a 10 percent loss. The disease was also reported by Maneval and Burrill as being especially severe in Missouri. In that state out of 34 orchards containing 1668 acres in 12 counties, blotch was said to be the most serious disease in 17. In 12 of these orchards an average of 35 percent of the fruit was blotched. From Mississippi come reports that half of the plantings in that state are infected. In the Northeast, including New Jersey, Pennsylvania, Delaware, Maryland, and Virginia, the disease was not severe in 1923, probably causing less than 1 percent loss on the average over this area. Ohio and Illinois collaborators report 5 and 5.5 percent lossrespectively. In Virginia, Hurt reports 16 percent of all varieties at Crozet as being infected and on these the average infection was only one-tenth of one percent.

Relative prevalence:

Judging from the reports it is apparent that blotch was of the usual prevalence in 1923, however, it was certainly less severe in a majority of the states than it was in 1922. It would seem that the conditions which were unfavorable for scab affected blotch in a similar manner. The following table is presented to show the relative percentages of blotch in the important blotch areas.

Table 8. Percentage losses due to blotch, 1918 to 1923.

Percentage loss of marketable crop caused by blotch.

State	1918	1919	1920	1921	1922	1923 Prelim. Est.	State	1918	1919	1920	1921	1922	1923 Prelim. Est.
N.J.	.5	t	t	1.	1.	av.	Iowa	t.	*	t	t	3.	3.
Pa.	3.	1.	1.	1.	1.5	less	Mo.	1.	2.	4.	3.	t	more
Del.	t	t	t	0.5	3.	t	Nebr.	t	2.	3.	4.	-	-
Md.	1.	t	.5	1.	1.5	-	Kans.	10.	3.	10.	5.	10.	10
Va.	t	1.	t	t	2	2	Ky.	1.	1.	10.	5.	35.	35.
W.Va.	t	1	1.	1.	t	1	Tenn.	5.	5.	10.	5.	8.	-
N.C.	-	5.	10.	10.	-	3.	Ala.	5.	8.	10.	-	-	10.
S.C.	5.	2.	8.	-	-	-	Miss.	10.	5.	5.	4.	6.	3.
Ga.	t	3.	2.	1.	-	-	La.	-	*	*	10.	t	-
Ohio	1.	1.	1.	2.	5.	5.	Texas	5.	8.	5.	3.	2.	2.
Ind.	1.	1.	1.	2.	2.	2.	Okla.	t	8.	8.	10.	-	-
Ill.	2.	3.	4.	7.	6.	5.5	Ark	t	2.	5.	3.	3.	3.

Dates of earliest appearance

May 14	Newton County, Miss.	June 10	Seaford, Del. (fruit)
May 24	Hardin, Ill.	" 11	Crozet, Va.
June 6	Seaford, Del. (leaf)	" 22	Monmouth County, N. J.
" 7	Orange County, Md.	" 29	Columbus, Ohio

Weather relations:

In the middle Atlantic states where blotch was generally less severe than in 1922 precipitation was generally deficient at the critical periods for severe infection in May and June. Gardner reports that heavy precipitation and high temperatures in May and June were responsible for the severe infection in southern Indiana. Anderson reports that heavy rains in early May resulted in a severe outbreak in southern Illinois. The heavy losses in Missouri are said by Burrill to be brought on by heavy precipitation and high temperatures which prevailed during the spring and summer.

Varietal susceptibility:

Gardner in Indiana reports fruit infection on Transparent, Fallawater, Siberian Crab, White Pippin, Dr. Matthews, Turley, Rhode Island Greening, Oliver, Red June, Fameuse and Clayton; cankers noted on Winter Maiden Blush and Fallawater; leaf infection found on Jonathan. In orchards containing blotch carriers, such as Ben Davis, widespread fruit infection of Grimes and Jonathan occurred.

APPLE - Blotch (varietal susceptibility)

Susceptible

Smith Cider - New Jersey Pennsylvania, West Virginia, Kentucky
Northwestern Greening - Delaware, Virginia, West Virginia, Georgia
Pippin - Virginia, West Virginia
Ben Davis - Virginia, West Virginia, Kentucky, Alabama, Missouri, Illinois, Indiana
Stark - West Virginia
Gano - West Virginia, Kentucky, Missouri
Rome - Kentucky
Champion - Kentucky
Huntsman - Missouri
Jonathan - Missouri
Grimes - Missouri
Delicious - Missouri
Paines - Missouri
Ingram - Missouri
Winesap - Missouri

Resistant

Winesap - Kentucky
Stayman - Kentucky
Delicious - Kentucky
Transparent - Kentucky
Wealthy - Kentucky
Jonathan - Kentucky (?)

The following table gives data on the comparative susceptibility of apple varieties to blotch, arranged according to the group classification of Hedrick and Howe, (see cedar rust).

Table 9. Comparative susceptibility of groups of apple varieties to apple blotch.

Group number and name	Variety	Relative susceptibility and reporter		
		Very susceptible	Moderately affected	Resistant
3 Ben Davis	Ben Davis	R,Sy,L,D,G,(O) (Ln) (Sy)(F) (An)(G)(E)(H) (Sd) (St) (V&M) (Ms)	(B)(Rs)	
	Collins	D (V&M)	R, G	
	Gano	R,L,D,G,G',(E) (Ln)(Sd)		
	Shackleford	D		
5 Blue Pearmain	Gideon		G	
	White Winter Pearmain	R,L		
7 Early Harvest	Early Harvest	(H)		
	Early Ripe			(H)
8 Fameuse	Fameuse	R		

APPLE - Blotch (comparative susceptibility)

Group number and name	Variety	Relative susceptibility and reporter: Very susceptible	Moderately affected	Resistant
10 Jonathan	Esopus		G	
	Jonathan			R,L,G,(An) (E)(H)
12 Lady	Lady		D	
13 Lawver	Akin	(B)G,G',		
	Lawver	R	D	
	McAfee	G'	R,L	
14 Limbertwig	Limbertwig	R,Sy,L,D,(Fu) (Re)(F)(E)(H)		
18 Northern Spy	Northern Spy		R,L	
	Wagener	R,L,(Sy)		
19 Oldenburg	Oldenburg	G,(G)(An)(H) (Sd)	R,D	
20 Ralls	Ingram		R,D	
	Milam		D	
	Ralls	D	R,L	
	Salome		G	
21 Rambo	Domine	R,L		
	Rambo		R,G	
22 Red Astrachan	Red Astrachan	D(Re)		
23 - Reinette				
23a Fall Pippin	Banana		D	
	Ewalt	(Fu')	D	
	Maiden Blush	R,L,^{G} (O)(An) (G)(H)(E) (V&M)	(Rs)	
23b Rhode Island Greening	Northwestern Greening	R,L,Sy,D,G,G' (T)(Sd)(P)(F) (Sy)(Rd)(G) (Me)(O)(An)		
	Rhode Island Greening	D (G)		
23c Newtown	Grimes Golden	(Sy) (O)	R,G	L,^{D}(An)(H) (Do)
	Huntsman	R,L		
	White Pippin		G	
	Yellow Newtown	(F)	R (F)	

APPLE - Blotch (comparative susceptibility)

Group number	Variety	Relative susceptibility and reporter Very susceptible	Moderately affected	Resistant
23d Swaar	Mann	Sy,G,G',(Sy) (G)	D	
24 Romanite	Gilpin	R,L		
	Minkler		R,L	
	Stark	Sy,D,G,G',(Sy) (Fu')(G)(Do) (Sd)	(O)	
	York Imperial			R,L,G,(F)(H)
25 Rome	Rome Beauty	G'(An)(V&M)(B) (Fu)	R,L,D,(Sy)	
26 Russet	Golden Russet		R	
27 Summer Rambo	Summer Rambo	(Sy)		
33 Wealthy	Wealthy		R,L.G	(O)
34 Winesap	Arkansas	(Ln)	R	D,G
	Arkansas Black	R,L.G',(Ln)	D	
	Kinnard		D,G	
	Mammoth Black Twig	L (Ln)		(F)
	Oliver	D		
	Paragon	(H)		D
	Stayman		R,L	G(An)(F)(H)
	Winesap			R,L,D (H)(F)
35 Yellow Bellflower	Yellow Bellflower		R,L	
36 Yellow Transparent	Yellow Transparent	G',(E)		(H)

D - G. M. Darrow, U. S. Dept. Agr. Bul. 1189. 1923
G - M. W. Gardner, Laurenz Greene, and C. E. Baker, Indiana Agr. Exp. Sta. Bul. 267. 1923
G' - M. W. Gardner, Hoosier Hort. 6^1: 3-11. Jan. 1924
L - D. E. Lewis, Kansas Agr. Exp. Sta. Bul. 196. 1913
R - J. W. Roberts, Bureau Plant Ind, Bul. 534. 1917
Sy - A. D. Selby, Ohio Agr. Exp. Sta. Bul. 333. 1919

() - Report in Plant Disease Survey files

An - H. W. Anderson, Illinois
B - J. T. Barrett, Illinois
Do - B. W. Douglas, Indiana
E - J. A. Elliott, Arkansas
N - J. B. S. Norton, Maryland
O - C. R. Orton, Pennsylvania
P - L. H. Pammel, Iowa
Rd - G. M. Reed, Missouri

F - F. D. Fromme, Virginia
Fu - H. R. Fulton, North Carolina
Fu' - H. R. Fulton, Pennsylvania
G - M. W. Gardner, Indiana
H - L. R. Hesler, Tennessee
K - F. D. Kern, Indiana
Ln - C. D. Learn, Oklahoma
Me - I. E. Melhus, Iowa
Ms - L. E. Miles, Alabama
Re - H. S. Reed, Virginia
Rs - F. M. Rolfs, Missouri
Sd - E. C. Sherwood, West Virginia
Sh - J. L. Sheldon, West Virginia
St - E. A. Stokdyk, Kansas
Sy - A. D. Selby, Ohio
T - C. E. Temple, Maryland
V&M - W. D. Valleau & W. W. Magill, Kentucky

Control:

Reports for 1923 indicate good control of blotch when the sprays were timely applied.

Kentucky: Ben Davis receiving Bordeaux Mixture at two week intervals after petal fall showed 50 percent blotch. (Valleau)
Alabama: Held in control by spraying. (Miles)
Arkansas: Very little in well-sprayed orchards. (Young)
Ohio: Excellent control by use of well timed sprays. (Thomas) "Spraying with Bordeaux (6-12-100) at petal fall and 2,4,6 and 10 weeks later, gave an average of 90 percent blotch-free fruit, while the checks showed 60 percent blotch. One tree was left unsprayed at each application, the results indicating that no one application was most important." (Stover & May (1))

In general the reports indicate that sprays applied about the petal fall period are very timely for preventing initial infection. Bordeaux mixture still seems to give the best results.

References:

Cited:

(1) Stover, W. G. and Curtis May. Studies in apple blotch in Ohio. (Abstract) Phytopath. 14: 60. Jan. 1924.

Not cited:

Anonymous: Apple blotch control. Indiana Agr. Exp. Sta. Rept. 1922: 37. 1923.
Ballou, F. H. & I. P. Lewis. Spraying experiments in southeastern Ohio. Ohio Agr. Exp. Sta. Mo. Bul. 8: 42-50. 1923.
Brock, W. S. The control of blotch and scale. Trans. Illinois State Hort. Soc. 56: 432-439. 1923.
Gardner, M. W. Origin and control of apple blotch cankers. Jour. Agr. Res. 25: 403-418. 1923.
__________ Apple blotch in Indiana. Hoosier Hort. 6¹: 3-11.
Gardner, Max., Laurenz Greene, and C. L. Baker. Apple blotch. Indiana Agr. Exp. Sta. Bul. 267: 1-32. 1923.

APPLE - Bitter rot

Bitter rot caused by *Glomerella cingulata* (Stonem.) S. & von S.

Geographical distribution:

Bitter rot appears to have been more restricted in general distribution in 1923 than in 1922. No reports were received from the south Atlantic states and other outlying regions such as the extreme northeastern states and the extreme western areas as Kansas and Nebraska. As in the case of scab and blotch the distribution seems to have been quite irregular, the Ohio, Missouri, and southern Mississippi valley states appearing to suffer the heaviest losses. The accompanying map of the known distribution of bitter rot in the United States was adapted from one prepared by Dr. E. F. Guba.

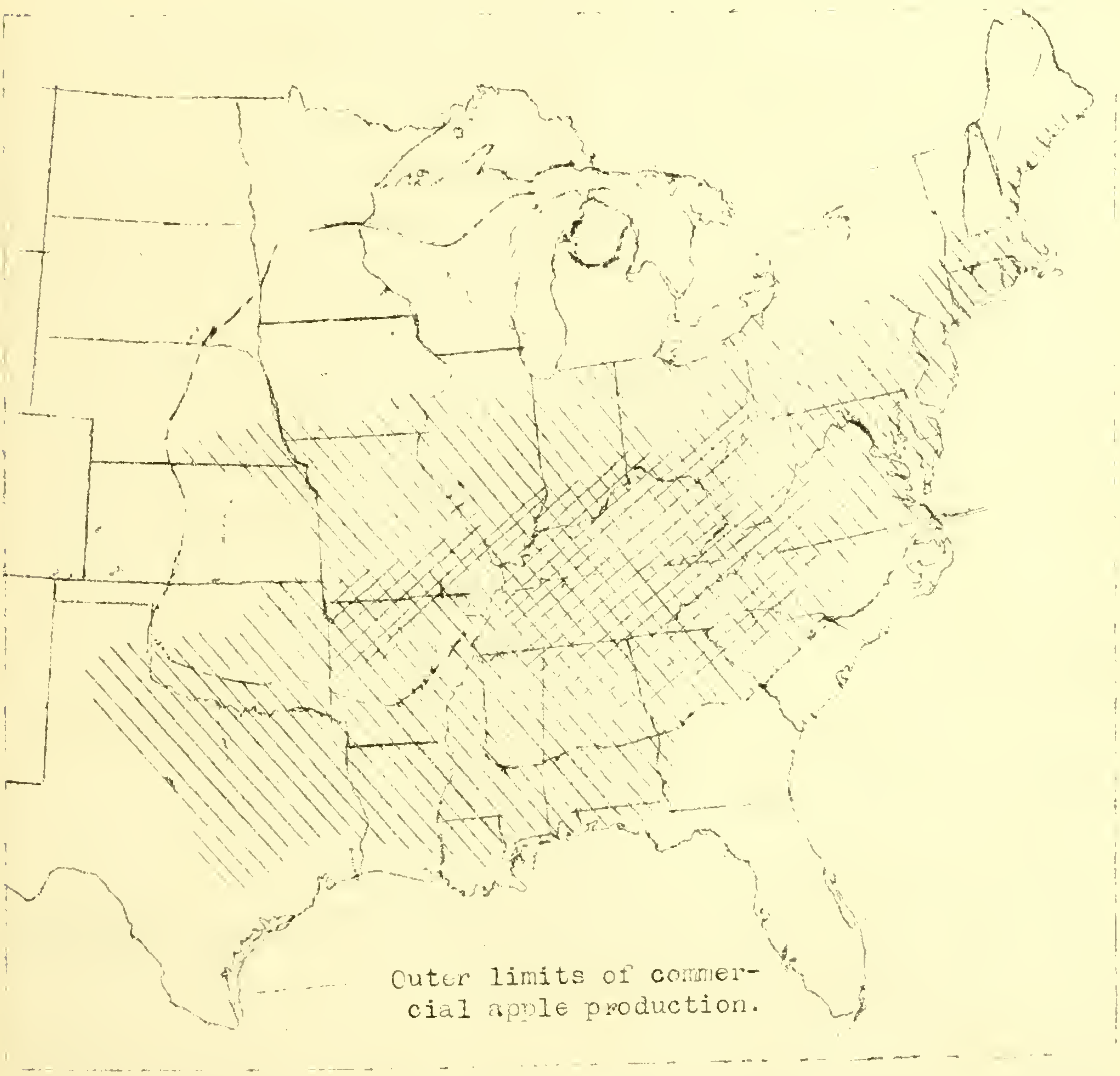

Fig. 1. Distribution and severity of bitter rot of apple, as indicated by all records in the Plant Disease Survey. (Map prepared by E. F. Guba.)

APPLE - Bitter rot

Dates of first appearance

June 6 Kemper County, Miss.
" 12 Whitchall, Albemarle Co. Virginia.
" 16 Mulberry Grove, Bond Co. Illinois
" 26 Warrick Co., Indiana
Aug. 10 Seaford, Del.
" -- Delaware County, Ohio
" 15 Clintondale, Ulster Co. New York

Economic importance

While the losses from bitter rot were negligible in the New England States, New York, and Pennsylvania, they were more severe than usual in Delaware where the loss was estimated at 1.5 percent. Bitter rot was also severe in northern Georgia on Ben Davis and other susceptible varieties. The losses can be best shown by the following table.

Table 10. Percentage losses from bitter rot of apple as reported by collaborators, 1923.

Percentage loss	States reporting
15	Tennessee
8	Kentucky
4	Missouri
3.5	Mississippi
1.5	Delaware
1.0	Maryland, Ohio, Indiana, Illinois Alabama, Arkansas
0.5	Virginia, West Virginia
trace	Massachusetts, New York, Pennsylvania, Texas

Relative prevalence

Average annual losses due to bitter rot in the United States 1918 - 1922.

1918	1919	1920	1921	1922	Average
.5	1.21	1.0	.2	.7	.72

The data for 1923 indicate the total losses for the United States to to be greater than usual, and possibly greater than for any year since these reports on losses have been kept for bitter rot.

Weather relations:

The regions where bitter rot was severe appear to coincide with the areas where the rainfall and temperature were above normal during August. This is well brought out in the accompanying chart prepared by Dr. E. F. Guba, covering the temperature and precipitation records in southern Illinois during the years 1920 to 1923.

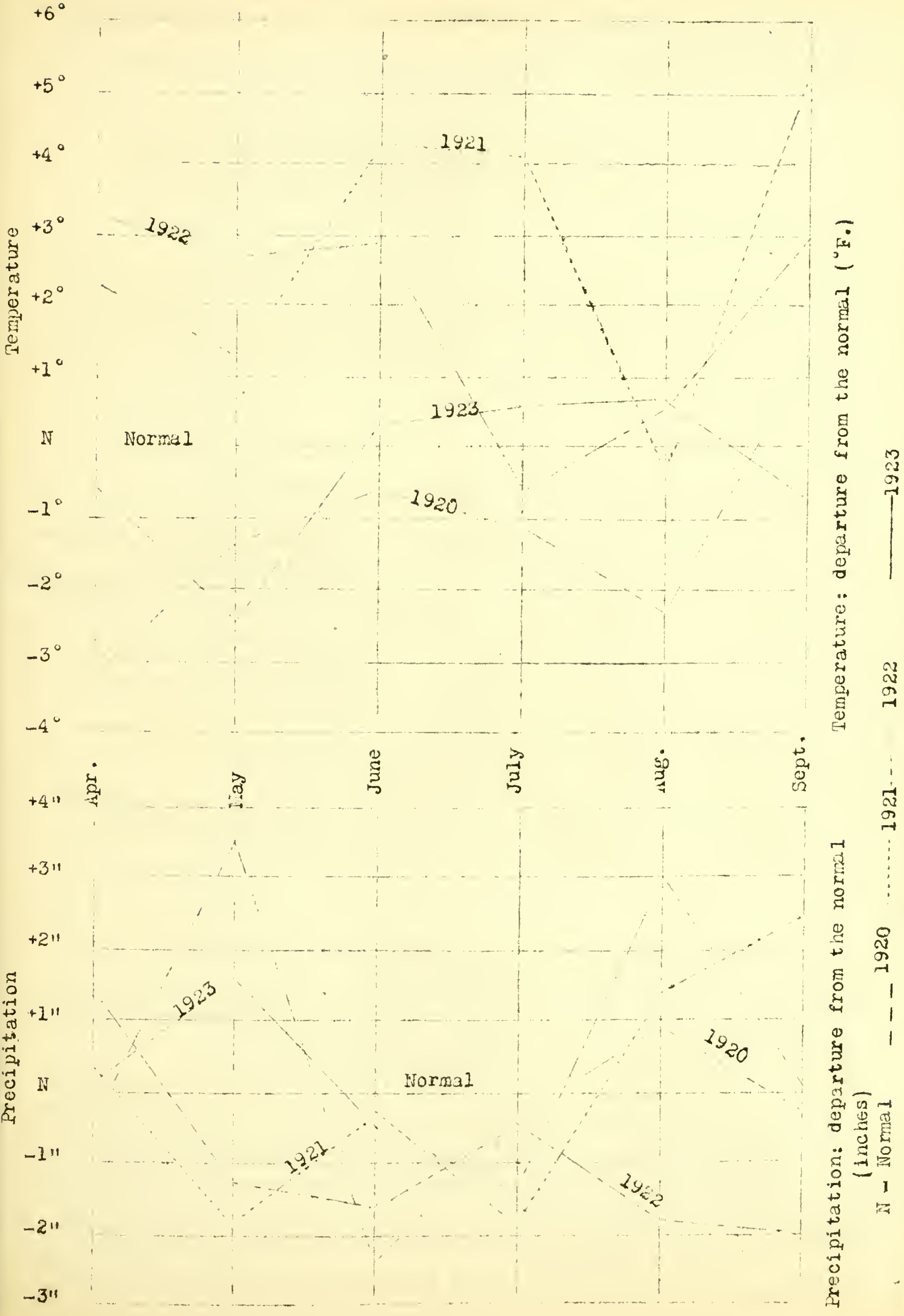

Fig. 2. Departures from the normal temperature and precipitation in southern Illinois, April - September, 1920 - 1923.

Regarding the situation in southern Illinois, Anderson make the following statement:

> "Bitter rot was worse this year than for at least ten years. It occurred rather generally over the southern end of the state. Growers have become careless due to the fact that bitter rot has been of so little importance during the last few years."

In Indiana Gardner reports that the outbreak of bitter rot in 1923 was correlated with high rainfall and temperature, and collaborators in Kentucky report similar conditions. In Tennessee where the losses were particularly severe the precipitation for August was 2.06 inches above normal for the state, while the temperature was slightly above normal indicating conditions favorable for bitter rot.

Varietal susceptibility:

The following varieties were reported susceptible in 1923.

Ben Davis - Kentucky Tennessee, Illinois, Virginia
Bismarck - Maryland
Champion - Indiana, Illinois
Cole - Delaware
Commerce - Illinois
Delicious - Kentucky
Greenville - Indiana
Grimes - Virginia, Indiana
Huntsman - Illinois
Jeffries - Tennessee
Jonathan - Delaware Tennessee, Indiana, Illinois
King David - Delaware, West Virginia, Tennessee, Illinois
Kinnard - Illinois
Lowell - Illinois
McIntosh - Delaware
Nero - Delaware
Northwestern Greening - Delaware
Ohio Nonpareil - Virginia
Piedmont Pippin - Virginia
Pippin - Virginia
Red Astrachan - Massachusetts
Rhode Island Greening - New York
Shackleford - Virginia
Smokehouse - Maryland
Stayman - Delaware
Transparent - Illinois
Winesap - Virginia, Indiana
York Imperial - Delaware, Tennessee, Virginia

Control:

Delaware: When copper sprays were applied in July and August very little infection was found (Adams).
Kentucky: Ben Davis and Delicious not receiving sprays in late summer have from 5 to 40 percent infection from bitter rot (Magill).
Arkansas: Not serious in well sprayed orchards (Young).
Ohio: Difficult to find in sprayed orchards (Thomas).
Indiana: In an orchard well sprayed with lime sulfur in Knox County, scattered infection occurred in August on Winesap, Jonathan and other varieties. The originally infected fruits were picked and removed from orchard and Bordeaux mixture applied. No more trouble. Believe bitter rot follows San Jose scale attacks about the next year (Gardner).
Illinois: Where Bordeaux was applied when the disease just appeared it was checked (Anderson).
Missouri: Spraying did not control in orchards of Missouri Fruit Experiment Station (Rhoads).

Recent literature

Roberts, J. W. Apple bitter rot cankers in the eastern United States. Phytopath. 13: 461. Oct. 1923.

Blister canker caused by *Nummularia discreta* Tul.

Blister canker in 1923 appears to have been about as prevalent as usual. The disease is confined chiefly to the Ben Davis variety which is very susceptible, though of course other varieties are attacked. There appears to be considerable evidence from reports over a period of years that blister canker has been overrated in importance in commercial apple orchards. Practically all of the serious injury outside of Ben Davis plantings has occurred in neglected orchards. The most comprehensive survey in 1923 was made in Arkansas by P. H. Millar of the State Plant Board, and reported by V. H. Young. Of 107,611 trees inspected 6.25 percent were infected with *Nummularia*. In New York twenty orchards in the Hudson Valley showed considerable increase in number of cankers over what was found in 1922. Fully half of all these cankers were on Ben Davis, according to Guba. Adams reports a rather severe infection on Yellow Transparent in Sussex County, Delaware, which was associated with careless pruning and injury during cultivation. That blister canker follows injuries of all sorts is well known. Tehon and Anderson report that this disease may be found in 25 percent of the plantings in Illinois, but that the loss, which occurs chiefly in the central portion of the state, does not amount to more than 1 percent usually.

Recent literature:

Anderson, H. W. Blister canker in Illinois. Better Fruit. 17, No. 7: 11, 24. Jan. 1923.

"Frog Eye", Black Rot, and New York Apple Tree Canker.

Introductory note:

The disease reported as black rot in the past few annual summaries on fruit diseases, includes the frog eye leaf spot as well as the black rot of the apple and the so-called "New York apple tree canker." It is perhaps doubtful whether such a combination is justifiable, even though it is the usual treatment accorded these subjects in much of our literature. *Sphaeropsis malorum* Peck, the conidial stage of *Physalospora cydoniae* Arnaud, is a very common saprophyte on apple wood and many other woody hosts. There is no question regarding its being the cause of black rot of apple fruit, usually entering the fruit as a semi-parasitic organism, through the injuries caused primarily by insects, spray burns, etc. Such injured fruit can hardly be classed as being of sufficient commercial value to warrant the consideration of black rot as anything more than an incidental storage rot.

As for its relation to the "New York apple tree canker," it may be stated that a very high proportion of the cankers, upon which this fungus fruits abundantly, are produced primarily by *Bacillus amylovorus* (Burr.) Trev. Other cankers with which it is associated are those commonly found in the crotch, due to freezing injury, and those caused by insects such as are found on the Jonathan variety. The fungus also encroaches on the bark and wood of trees weakened by scale. The comparatively few successful attempts to produce typical cankers by inoculation with Sphaeropsis malorum are more than offset by the large number of failures to produce cankers which have been recorded in the literature, and by data which have not been published. Sphaeropsis malorum is certainly a very weak parasite on woody parts, and in general can only attack and progress on trees much weakened from other causes.

The evidence that Sphaeropsis malorum is the cause of "frog eye" leaf spot of the apple rests chiefly upon the early work of Scott and Rorer in Arkansas. Other workers have not been as generally successful in producing the typical "frog eye" under controlled conditions. The writer (Orton) and his associates have for several years failed to secure infection in Pennsylvania with isolations of Sphaeropsis from various sources. Whether there is a difference between the "frog eye" diseases as they occur in different parts of the country remains to be shown.

The writer therefore desires to make it clear than in the following report an attempt has been made to separate the discussion into three parts as indicated above. Of these troubles "frog eye" is unquestionably the most important.

Frog eye

Throughout the country "frog eye" was less widely distributed and less abundant than usual. The only collaborators reporting more than the usual amount of infection were those from Ohio, Indiana, Minnesota and Iowa. From Massachusetts Delaware, Maryland, Indiana, Michigan, Mississippi, Texas, and Oklahoma, the reports indicate the usual amount of infection. All the other reports indicate less.

The following annual losses have been reported for the United States in The Plant Disease Bulletin:

1918	1919	1920	1921	1922	Average	
1.4	1.36	1.3	.5	1.5	1.21	... percent

It should be noted that the above figures include fruit rot and loss through cankers reported as being caused by Physalospora cydoniae. It may be presumed, however, that these two factors have generally been of minor importance. The losses in 1923 indicate less than the average.

Date of first infection observed:

April	25	Clemson College, S. C.
"	26	Burkeville, Va.
May	9	Bridgeville, Del.
"	18	Highwood, Conn.
"	23	Union Co. Pa.
"	23	Richland Co. Ohio
May	30	Kings Co. N. Y.
June	1	Crawfordsville, Ind.
"	4	Murphysboro, Jackson Co. Mich.
"	6	Topeka, Kans.
"	12	Ramsey Co. Minn.

"Frog eye" is a disease which is very dependent upon moisture during the period of infection, which in the East follows closely upon that of scab. The slight damage from "frog eye" was therefore correlated with the relatively dry season in many apple regions, particularly the northeastern sections. In those regions where the disease was more prevalent the precipitation and temperatures were more favorable during the early part of the season.

APPLE - Frog eye

In Delaware Stayman, Transparent, and Strawberry, were reported as being susceptible. Ben Davis and Delicious were susceptible in Kentucky, Maiden Blush in Illinois and Jonathan in Kansas. Malus ioensis was reported as susceptible in New York.

Black rot of apple fruits caused by Physalospora cydoniae Arn.

Black rot was reported in 1923 from Massachusetts, Connecticut, New York, Delaware, West Virginia, Arkansas, Ohio, Indiana, Minnesota,and Illinois. In all of these states it was apparently of slight importance except in Delaware, where Adams reports it as being severe on the early varieties, such as Fourth of July, Red Astrachan, Williams Early Red, and Transparent. It was apparently associated with the greater prevalence of curculio and codling moth in Delaware. Giddings also reports it as being associated with insect damage in West Virginia. In Indiana, black rot was found following blotch infection, according to Gardner. In Minnesota, Greenings are said to be the only variety noticeably susceptible to black rot.

New York apple tree canker

Canker was reported as being of common occurrence in New York, Ohio and Wisconsin. In Indiana, Gardner reports a case of Sphaeropsis following rust infection on the twigs of Rome Beauty in Orange County. Thomas reports canker following fire blight in Ohio, and in Minnesota it is said that it invariably follows fire blight on the twigs. Collaborators should watch carefully the relationship of Sphaeropsis infection to primary cankers caused by fire blight and other agents such as freezing or sun scald, and trees weakened by scale, root rots, etc.

Recent literature:

Cunningham, G. H. Black rot (Physalospora cydoniae Arn.). A fungous disease of apple, pear and quince. New Zealand Jour. Agr. 27: 95-102. 1923.

Cedar rust caused by Gymnosporangium juniperi-virginianae Schw.

According to the collaborators' reports for 1923, cedar rust was distributed about normally. Although there was a general decrease in its severity below that of 1922, apparently the disease was of nearly average severity in the red cedar areas, except in certain sections of some states such as Virginia and West Virginia, where eradication has aided materially in reducing the infection. The areas where cedar rust was most destructive were Virginia, West Virginia, and North Carolina, where 2 percent loss occurred, and in Iowa, where 3 percent loss was reported. All other collaborators reporting on cedar rust indicate losses amounting to not more than 1 percent of the crop, and usually only a trace.

Relative losses from cedar rust in the United States, 1919 - 1922

1919	1920	1921	1922	Average
1.7%	1.1%	.2%	1.6%	1.15%

Dates of earliest recorded appearance, 1923.

Foliage infection:

Pycnia, April 26 : Burkeville, Virginia
" May 24 : Millsboro, Delaware, (Duchess var.)
June 1 : Crawfordsville, Indiana
" 4 : Columbia Co., New York
" 23 : McLeod Co., Minnesota

Fruit infection:

June 9 : Shenandoah Valley, Virginia
" 20 : Bridgeville, Delaware, (Rome var.)

Weather relations:

Cedar rust is exceedingly dependent upon moisture for the development of the telial horns on the cedars, and upon the proper combination of temperature and moisture for the infection of the apple (foliage or fruit) by the basidiospores. It is frequently difficult to compare outbreaks of cedar rust with the weather reports on precipitation and temperature, since, as is well known, cedar rust basidiospores may be disseminated and infection of the apple take place within a very short time, when favorable moisture and temperature conditions are correlated with the most susceptible condition of the apple foliage. In some cases a very slight precipitation at a critical time may result in heavy infection, and unless exact data were taken at the time it would be practically impossible to detect such periods through a study of the weather records.

The weather relations as reported by the collaborators indicate that the periods when the weather conditions were favorable for infection, were generally very short and few in number, with the result that the losses were slight except in the few cases noted. While Fromme and Schneiderhan state that cedar eradication in Virginia accounts in part for the great reduction in loss incurred by rust, the dry spring was probably of even greater importance in keeping the infection to a minimum. In Virginia, infection must have taken place during the pre-pink to pink stage, as it first appeared on the foliage at the time of petal fall.

Varietal susceptibility:

It has been recognized for many years that very clear cut differences in susceptibility to cedar rust exist between the different varieties of apples. As long ago as 1897 Chester (1) reported upon the rust resistance of a considerable number of varieties growing in Delaware. Later Stone (6) in Alabama, Reed and Crabill (4) in Virginia, Selby (5) in Ohio, and Giddings (2) in West Virginia published similar lists showing the relative susceptibility of apple varieties to rust. Valleau (7) furnished a very large list from Kentucky, which was included in the summary of 1922. Other collaborators have furnished supplementary and corroborative lists. Since the reaction to rust of such a large number of apple varieties is known it seemed highly desirable to collect and compare these data in tabular form and ascertain whether there is evidence of any such group relationship as occurs in the case of the reaction of potato varieties to the wart disease.

APPLE - Cedar rust (varietal susceptibility)

We have resorted to the classification published by Hedrick and Howe (3) for ascertaining the group to which any variety belongs. Unfortunately more than half of those varieties, upon which reports of rust resistance are available, are not included in the Hedrick and Howe list and there seems to be no immediate hope of ascertaining their group relationship. However, it has been possible to place a considerable number of varieties into what appear to be natural groups and when such groups are compared from the standpoint of the rust resistance of the individual varieties within the group, it appears that considerable significance should be attached to these tables. For instance, it should be noted that varieties constituting such groups as Aport, Ben Davis, Oldenburg and Gravenstein, Reinette, Winesap, and Yellow Transparent, show marked resistance or immunity quite uniformly, while the varieties belonging to such groups as Jonathan, Romanite, Rome and Wealthy are almost invariably very susceptible.

The apparent discrepancies occurring in the table, as shown for instance in the Grimes sub-group of Reinette, may be due to unavoidable errors such as:

(1) Misnomers.

(2) Misinterpretaion of terms used by reporters.

(3) Differences due to variation in the degree of infection in different localities or in different years. Varieties which are rather resistant during years of light infection may appear quite susceptible under conditions favorable for severe infection. Sometimes local conditions prevent foliage development at the time of teliospore discharge, with the result that susceptible varieties escape infection.

(4) The presence of different biological races of cedar rust which react differently to the same variety of host. That biological races of cedar rust probably exist is suggested by the conflicting reports upon such a well known variety as Ben Davis, which has been placed in each of the four classes by various observers, but even more suggestive are the observations of Waite (8) indicating a difference in the degree of severity of rust in the alternating years. Waite says, "The fungus in the odd years, which is, of course, a different set of individuals since this organism has a two year cycle, has increased in severity, but is always less abundant than in the even years." Waite also believes that the rust is adjusting itself continuously to new varieties. Our knowledge of other rusts leads us also to expect physiological races in cedar rust.

Key to abbrevations used in the table

An = H. W. Anderson, Illinois
B = J. T. Barrett, Illinois
C = F. D. Chester, Delaware
Ch = C. Chupp, New York
Cl = G. P. Clinton, Connecticut
Cr = C. H. Crabill, Virginia
F = F. D. Fromme, Virginia
Fr = E. N. Freeman, Minnesota
Fu = H. R. Fulton, Pennsylvania
G = N. J. Giddings, West Virginia
Ga = M. W. Gardner, Indiana
J == H. S. Jackson, Indiana
K = F. D. Kern, Indiana.
L = B. F. Lutman, Vermont
M = W. E. Maneval, Missouri

Me = I. E. Melhus, Iowa
O = C. R. Orton, Pennsylvania
P = L. H. Pammel, Iowa
R = J. W. Roberts, Washington, D.C.
R&C= Reed & Crabill, Virginia
Rd = G. M. Reed, Missouri
Sr = E. A. Siegler, Washington, D.C.
S = R. E. Stone, Alabama
Sh = J. L. Sheldon, West Virginia
Sy = A. D. Selby, Ohio
St = E. C. Stakman, Minnesota
T = C. E. Temple, Maryland
V = W. D. Valleau, Kentucky
Vn = R. L. Vaughan, Wisconsin
() = Report in Plant Disease Survey files

Table 11. Comparative susceptibility of apple varieties to cedar rust arranged according to Hedrick and Howe (3).

Group No. and Name	Variety	Immune	Resistant	Mod. susc.	Susceptible
1 Aport	Alexander	V, R			
	Bietigheimer	C	S, R		
	Wolf River	V			
2 Baldwin	Bledsoe (Bledsoe Pippin)		S		
	Babbitt	R	S		
	Baldwin	G,V,R			
	Bayard				V
	Sutton		V, R		
	Bostick Queen (Bostick)				C
3 Ben Davis	Ben Davis	V	C,R,G,R&C, Sy, (P)		
	Collins	V,S,R			
	Apple of Commerce (Beach)	S			
	Florence	V,R.			
	Gano	V,S,R			
	Shackleford	S		R	
	Arkansas Beauty			R	
5 Blue Pearmain	Pearmain		S		
	Gideon			R	
	Windsor	V			
6 Chenango	Chenango	V			
7 Early Harvest	Early Harvest	V,C,R	S		
	Early Ripe			R	
8 Fameuse	McIntosh	V,R			
	Shiawassee			R	
9 Hibernal	Hibernal	(St)			
10 Jonathan	Esopus	R			V
	Jonathan			R	G,S,R&C,V, (Rd) (An) (Sy) (K) (Cr) (Ga) (M) (Ch)
	King David	V			
	Mother	R			V
	Red Canada	V,R			

APPLE - Cedar rust

Group No. and Name	Variety	Immune	Resistant	Mod. susc.	Susceptible
13 Lawver	Akin	R	S,V,C		
	McAfee	C			
	Lawver	R			
14 Limbertwig	Limbertwig	V,C	S		
15 Longfield	Longfield	(P)			
16 Livland Raspberry	Livland Raspberry	V			
18 Northern Spy	Northern Spy	R	V		R&C, (R)
	Summer Hagloe	C			
	Wagener	V,C,R			
	Stannard			R	
19 Oldenburg (Duchess)	Hackworth	V			
	Black Buda	S			
	Charlamoff	V			
	Okabona	(St)			
	Oldenburg	V,(P),(St			
	Pewaukee	R	V, (K)		
	Gladstone			R	
19-A Gravenstein	Gravenstein	V,S,C			
20 Ralls	Giant Gentian	V			
	Doctor Walker				C
	Ingram	V			
	Milam	V			
	Ralls	C	S,V		
	Salome	V,R			
21 Rambo	Domine	V			
	Rambo			V,(O)	
				R	
	Red Rambo			R	
22 Red Astrachan	(Astrachan)	V			
	Oszi		S		
	Red Astrachan	S,C,R	G		
23 Reinette					

APPLE - Cedar rust

Group No: and Name	Variety	Immune	Resistant	Mod. susc.	Susceptible
23-A Fall Pippin	Banana			V,(Fr)	Sr
	Elgin Pippin		S		
	Fall Pippin	V,S,C,R			
	Maiden Blush			R	
23-B Rhode Island Greening	Northwestern Greening	V	R&C, (Cr),(St)	G	
	Rhode Island Greening	V			
	Starr	V			
23-C Newtown	Grimes		V,S,R&C,G,(Cr),(Ga),(K),(P),R		C
	Huntsman	V			
	Newtown Pippin (probably Yellow Newtown)	C,R.			
	Shannon	R			C
	White Pippin	V		R	
	Yellow Newtown	V	R&C, (Cr)		C
23-D Swaar	Mann	V,C.			
24 Romanite	Buckingham	V,R	(Fr)		S
	Gilpin				C
	Lansingburg	V			
	Minkler				C,V,(B)
	Nero			R	C,V
	Romanite			V	
	Stark			V	C
	York Imperial		S,V	R	G,R&C,C,(T),(R), (Cr),(O)
25 Rome	Langford (?)		C		
	Rome				(Rd),(Fr),(K),(T),(P),G,Sy,R&C,(J),(Cr)
26 Russett	Golden Russet	V,R			C
27 Summer Rambo	Summer Rambo				(O)
28 Sweet Bough	Sweet Bough	V,C	S		
29 Tetofski	Tetofski	(P),R			

APPLE - Cedar rust

Group No. and Name	Variety	Immune	Resistant	Mod. susc.	Susceptible
30 Tompkins King	Tompkins King	R			
	Hubbardston	R		V	
	Ozone		R		
31 Twenty Ounce	Twenty Ounce	R	G		
32 Vandevere	Vandevere	R			
33 Wealthy	Wealthy				G,Sy,V,(Cl) (Sy),(An), (Mc),(Fr), (St),(F),(P) (Sh),(Ch), (Va),(K),(L)
	Peter			R	
34 Winesap	Arkansas	S,C,G,V, (R)	(C)		
	Arkansas Black	C,G,R	V		
	Kinnard	S,C,V			
	Oliver (Senator)		R&C		S,V,R
	Paragon	R,V			
	Stayman Winesap	C,V,G,F,R	(Fr),(Ga),(T), (Cr),R&C,(C)		
	Winesap	S,C,V,G,F R	(Fr),(Cr),(O)		
	Vanhoy			R	
35 Yellow Bellflower	Ortley	V			
	Flory			Sr	R
	Yellow Bellflower	V,R			
	Barry				R
36 Yellow Transparent	Yellow Transparent	V,G,C,R			

Control:

A cedar eradication law was passed in New York. In Virginia the cedar eradication program has made a very distinct impression upon the cedar rust situation. In West Virginia the increased infection was attributed in part to the discontinuance of the cedar eradication program. In Arkansas the rust is reported as becoming less injurious in regions where cedar eradication is being continued.

Literature cited:

1. Chester, F. D. Apple rust. Ann. Rept. Delaware Agr. Exp. Sta. 8 (1896): 63-69. 1897.
2. Giddings, N. J. Infection and immunity in apple rust. West Virginia Agr. Exp. Sta. Bul. 170: 34-35. 1919.
3. Hedrick, U. P., and G. H. Howe. Apples: old and new. New York (Geneva) Agr. Exp. Sta. Bul. 361: 79-135. 1913.
4. Reed, H. S. & E. H. Crabill. The cedar rust disease of apples, etc. Virginia Agr. Exp. Sta. Tech. Bul. 9: 102-103. 1915.
5. Selby, A. D. Varieties of apples in Ohio: Disease susceptibility. Ohio Agr. Exp. Sta. Bul. 290: 35-41. 1915.
6. Stone, R. E. Cedar apples and apple leaf rust. Alabama Agr. Exp. Sta. Circ. 2: 1-11. 1908.
7. Valleau, W. D. Table 89. The Plant Dis. Bul. Suppl. 28: 297-298. 1923.
8. Waite, M. B. Cedar rust of the apple. Rept. Virginia State Hort. Soc. 18: 35-57. 1914

Fire blight caused by Bacillus amylovorus (Burr.) Trev.

Geographical distribution, economic importance and relative prevalence.

Fire blight was reported over a wider range than last year, particularly in the Rocky Mountain area. The map in figure 3 shows the reported distribution in 1923, together with the relative prevalence reported for 1923 as compared with 1922.

The areas where fire blight was especially severe were in New York and a band of territory extending westward through Ohio, Indiana, Illinois, Missouri, Arkansas, Kansas, Colorado, and into Texas and New Mexico. Blight was also severe in Wisconsin, Minnesota and North Dakota, as well as in Idaho, Nevada, and Washington. There is also evidence that blight was more severe in Massachusetts, Delaware, Maryland, Virginia, and North Carolina.

While blossom blight was the most prevalent phase of the disease in 1922, twig blight was the most prevalent in 1923, with numerous cases of fruit blight reported. Collar blight was again of some importance in Pennsylvania and West Virginia. The importance of these rather distinct phases of fire blight are largely associated with two factors - weather conditions and the prevalence of insect disseminators.

The relative prevalence may be obtained by studying the map in figure 3. A close scrutiny of the data compared with those presented during the past five years indicates that fire blight is on the increase and that the total losses in 1923 were probably greater than for the average year.

The estimated annual losses in the United States for the years 1918 to 1922 are shown herewith:

1918	1919	1920	1921	1922	Average
1.5%	.69%	1.2%	1.%	2.4%	1.36%

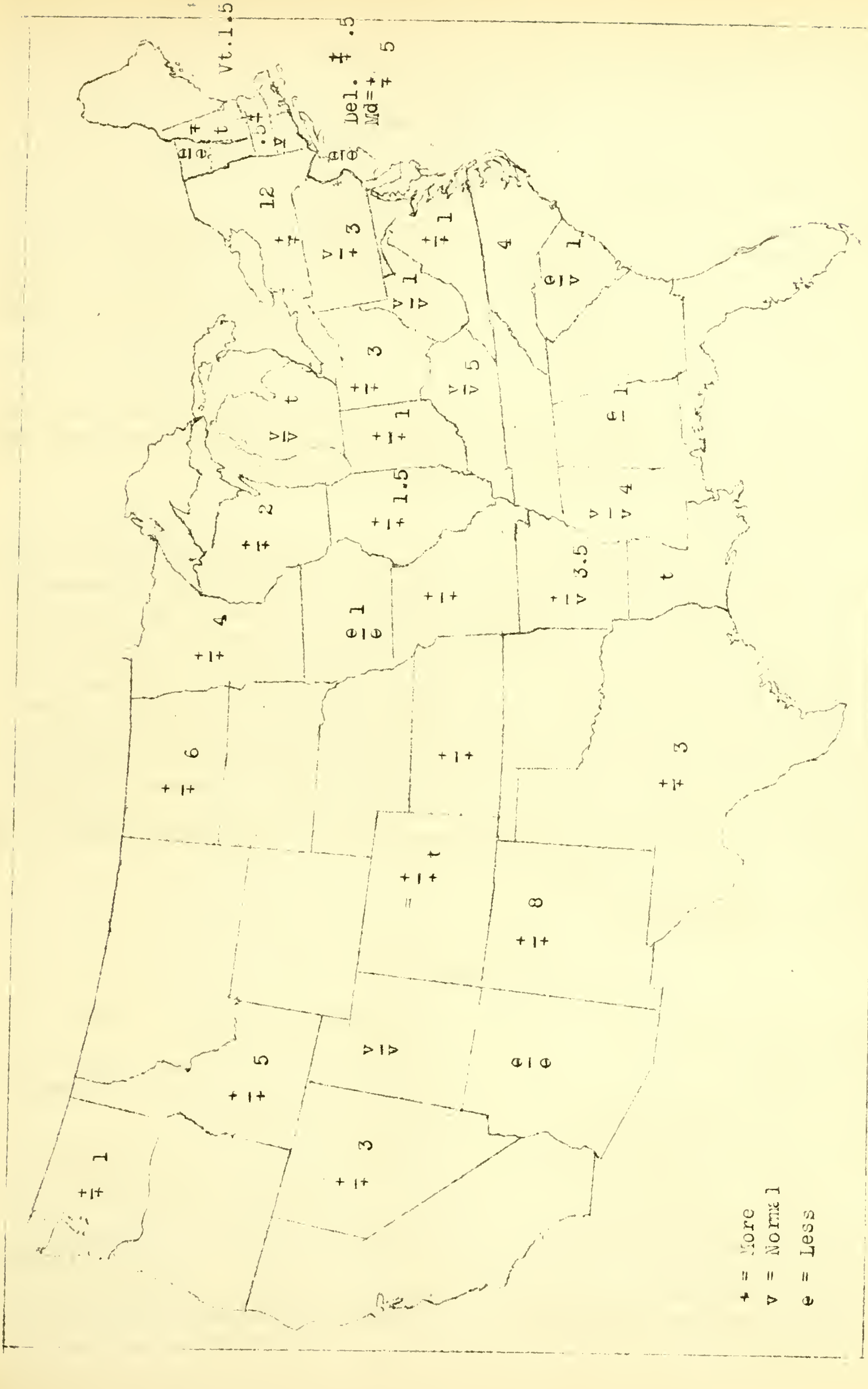

Fig. 3. Losses from fire blight in 1923 (figures) and relative prevalence compared with average year (above line) and with 1922 (below line).

APPLE - Fire blight

Dates of first appearance:

April 6 - Leflore Co.... Miss.
" 30 - Orange Co..... N. Y.
May 4 - Hancock Co.... Ohio.
" 9 - Bridgeville... Del.
" 18 - Daleville..... Va.
" 23 - Warrensburg... Mo.
" 24 - Laurence Co... Ind.

May 28 - Bridgeton.... N. J.
June 1 - Madison...... Wis.
" 1 - Delta........ Colo.
" 2 - Oraville..... Ill.
" 14 - Carver Co..... Minn.
" 16 - Lisbon,
Ransom Co.. N. D.

The period of greatest injury to the host was during June and July, when the blight in numerous cases spread to the young fruits and caused much damage in Connecticut, New York, Delaware and Virginia.

Weather relations:

While fire blight is generally conceded to be favored by warm moist weather, the records for 1923 as well as those for 1922 indicate severe infections associated with continued cool weather accompanied by prolonged rainfall. The apparent incompatibility of these observations may possibly be explained by the differing weather conditions during the periods of infection, as compared with the weather during the periods of progression of the disease. It seems certain that primary infection is favored by warm weather during the blooming period and just following this period. The disease once established on the growing parts has often been observed to persist and spread over relatively long periods when the weather remains cool and wet. Such conditions favor continued vegetative growth, always an important factor in the progression of blight which ceases as soon as the growth period comes to an end.

Varietal susceptibility:

Most susceptible

Albemarle Pippin - Virginia
Alexander - New York
Benoni - Illinois
Golden Delicious - Kentucky
Greenings - New York, Michigan
Jonathan - Arkansas, Ohio, Indiana, Illinois, Michigan, New Mexico, Idaho
King - New York, Indiana
King David - Illinois
Maiden Blush - Indiana
Polly Eads - Kentucky
Rome Beauty - Virginia, Kentucky, Indiana

Spitzenburg - Indiana, Idaho
Starr - New Jersey
Summer Rambo - Indiana
Tolman Sweet - Michigan, Wisconsin
Vandevere - Indiana
Wagener - Ohio
Wealthy - New York, Ohio, Indiana, Michigan, Minnesota
Wolf River - New York
Yellow Transparent - Delaware, Kentucky, Indiana, Illinois
York - Virginia
Crabs and seedlings in general - Minnesota

Moderately susceptible

Ben Davis - New Mexico
Black Twig - Indiana
Early - Indiana
Greenings - Minnesota
Indian - Indiana
Lowry - Virginia
Northern Spy - Indiana
Stark - Indiana
Stayman - Virginia, Indiana
Winesap - Virginia, Indiana, Illinois, New Mexico
York - Indiana

Quite resistant

Aiken - Indiana
Ben Davis - Indiana
Delicious - Indiana
Grimes - Indiana, Illinois
Oldenburg - Indiana
Red Astrachan - Indiana
Russet - Indiana
Wolf River - Indiana

Immune

Arkansas Black Twig - New Mexico

If the number of reports are indicative, Jonathan, Wealthy, and Yellow Transparent are the most susceptible varieties.

In Virginia, Fromme reports that counts of twig blight on three varieties gave the following figures denoting relative susceptibility:

Albemarle Pippin	4.8
York Imperial	4.3
Winesap	0.3

A survey by Kirby and Honey in a park at Rochester, New York gave interesting data on the relative susceptibility of various species and horticultural forms of Malus.

Light infection on

Malus arnoldiana
M. atrosanguinea
M. dawsoniana
M. floribunda
M. ioensis
M. orthocarpa
M. ringo
M. rivularis
M. spectabilis
M. scheideckeri
M. soulardi
M. transcendens
M. zumi

Moderate infection on

M. cashmeriana

In New Jersey apple trees adjacent to severely infected Crataegus were said to be most severely blighted.

The following table (12) lists the comparative susceptibility of apple varieties arranged according to the classification of Hedrick and Howe (see cedar rust, p. 66). It will be noted that varieties in the Aport and Jonathan groups (1 and 10) are rather uniformly reported as very susceptible, while those included in the Winesap Group (34) are more often said to be rather resistant.

Table 12, Comparative susceptibility of groups of apple varieties to fire blight.

Group number and name	Variety	Relative susceptibility and reporter			
		Very resistant	Resistant	Susceptible	Very susceptible
1 Aport	Alexander				Sw, H&H(Br) (Je) (Sl) (Ba) (Ch)
	Arabka				H&H
	Bietigheimer		Sy		
	Bismarck				H&H
	Constantine				H&H
	McMahon				Sw, H, (Vn)
	Wolf River	(Ga)	(0)		Sw, Sy
2 Baldwin	Babbitt	H&H, Sy			
	Baldwin	H&H	Sw, Sy (0) (Ch)	Sy	
	Sutton				H&H, Sy (Ch)
3 Ben Davis	Ben Davis	Sw, Rd (Ga) (Rd)	Sy(0) (V&M)	Sy	
	Gano	Sw, Rd (Rd)	Sy		(Sl)
4 Black Gilliflower	Black Gilliflower				H&H
7 Early Harvest	Early Harvest	Rd (0)	(Ga)		Sy
8 Fameuse	Fameuse			Sw	(P)
	McIntosh		Sw	Sy	(Sl)
	St. Lawrence			St	
10 Jonathan	Esopus			Sw, Sy	H&H, Sy(Fi) (Ga) (Ch) (Ow) (Hu) (Bs) (H&D)
	Jonathan		Sw	H, Sy	H&H, Rd, D(B) (Hu) (T&A) (Ga) (Ce) (Te) (F) (A) (Sk) (Np) (Ma) (V&M) (Br) (Sl) (L) (Rd) (An) (M) (Ow)
	Kaighn			D	
	King David	Sy	D		Sy (T&A)
	Mother				(H&H)
	Red Canada	Sy			

APPLE - Fire blight

Group number and name	Variety	Relative susceptibility and reporter: Very resistant	Resistant	Susceptible	Very susceptible
12 Lady	Lady	H&H			
13 Lawver	Akin	(Ga)			
14 Limbertwig	Limbertwig				D(Fu) (Hr)
16 Livland Raspberry	Livland Raspberry			Sy	D
18 Northern Spy	Northern Spy	H&H	(Ga)	Sy (O)	(Sl)
	Ontario	Rd		St	
	Wagener	Sw, H&H			Sy
19 Oldenburg	Oldenburg	Sw, Sy, D (P) (Ga)	Sy		
	Pewaukee				H&H
19a Gravenstein	Gravenstein			Sy	
20 Ralls	Ingram	Sy			Rd, D, (Rd)
	Ralls				H&H, D
	Salome			Sy	
21 Rambo	Domine		D		
	Rambo	Sy	Sy		
22 Red Astrachan	Astrachan	(Ga)	Sy		
	Red Astrachan	(O)			
23-Reinette					
23a Fall Pippin	Banana			Sy	Sw (Ga) (Ma) (V&M)
	Boiken		Sy		
	Fall Pippin				H&H, St (N)
	Greenville			Sy	
	Lowell			Sy	
	Maiden Blush		D(O)	Sy	Sy*(N) (E) (Ga)
23b Rhode Island Greening	Northwestern Greening	(Minn.) (Vn)	Sw, Sy		
	Patten Greening	(Minn.)			
	Rhode Island Greening				H&H, Sy, D
23c Newtown	Belmont		Sy	Sy*	
	Grimes Golden	H&H	Sw, Sy', (An) (T&A	(O) (G)	Sy(R) (Ow)
	Newtown Pippin	Sy'*	Sy*	Sy (Fu')	
	White Pippin	Sy			

APPLE - Fire blight

Group number and name	Variety	Relative susceptibility and reporter			
		Very resistant	Resistant	Susceptible	Very susceptible
23d Swaar	Mann			St, Sy	
	Swaar	H&H			
24 Romanite	Buckingham				(Fu)
	Minkler	Sy			
	Stark	Sy*	(Ga) (O)		Sy, D
	York Imperial		Sy' (O) (V&M) (Ga)	Sy	Rd, D (M) (Fu') (R) (G) (O) (Mc) (Ch) (A)
25 Rome	Lankford	Sy	Sy*, Sy'		
	Rome Beauty	Sw	(O)	(Ga)	H&H, Sy, D, (V&M) (Sl) (Fu) (Ch) (O) (Mc)
26 Russet	Roxbury		Sy		
	Russet	(Ga)			
27 Summer Rambo	Summer Rambo		Sy	(Ga)	(N) (O)
28 Sweet Bough	Sweet Bough	H&H		Sy	(N)
30 Tompkins King	Ensee			Sy	
	Hubbardston		Sy		
	Tompkins King	Sw, H&H		(O) (Ga)	Sy(Ow) (Ch)
31 Twenty Ounce	Twenty Ounce	H&H			D(O) (Ba) (Ch)
32 Vandevere	Vandevere			(Ga)	
33 Wealthy	Wealthy	Sy*	Sy', Sw	Sy(Ga)	(Minn) (M) (Vn) (Ma) (P) (Sl) (S) (O) (Rd) (V&M)
34 Winesap	Arkansas		Sy, D		
	Arkansas Black	(Cr)	Sy		
	Black Twig		(Ga)		
	Kinnard		D		
	Oliver			Sy	
	Paragon		D		
	Stayman	Sw(N) (Fu) (O)	Sy, D(V&M) (Ga)	Sy'	
	Winesap	Sy(Fu)	Sy', D(Ga) (V&M)		(T&A)
35 Yellow Bellflower	Yellow Bellflower	Sy*	Sy	Sy'	

APPLE- Fire blight

Group number and name	Variety	Relative susceptibility and reporter Very resistant	Resistant	Susceptible	Very susceptible
36	Yellow Transparent		(0)	Sw,Sy*,Sy' (Ga)	H,Sy,Rd,D (F) (G) (P) (T&M) (A) (Mc) (Ma) (V&M) (C) (Ev) (N) (J) (B) (Rd) (An) (Vn) (M) (O) (G) (E) (Te) (Hr)
Crabs	Hyslop			Sw	(O)
	Martha			Sw	
	Transcendent				Sw,St(T) (P) (Je) (Sl) (Fr) (J) (Minn) (Vn)
	Virginia				(Minn)
	Whitney			Sw	

D – G. M. Darrow, U. S. Dept. Agr. Bul. 1189. 1923.
H – J. L. Hewitt, Arkansas Agr. Exp. Sta. Bul. 113. 1913.
H&H – U. P. Hedrick and G. H. Howe, New York (Geneva) Agr. Exp. Sta. Bul. 361: 79-135. 1913.
Rd – G. M. Reed, Phytopath. 4: 27-30. 1914
St – V. B. Stewart, New York (Cornell) Agr. Exp. Sta. Bul. 329. 1913
Sw – D. B. Swingle, Montana Agr. Exp. Sta. Circ. 98. 1921
Sy – A. D. Selby, Ohio Agr. Exp. Sta. Bul. 290. 1915
Sy' – A. D. Selby, Ohio Agr. Exp. Sta. Bul. 133. 1913

* – collar rot
() – data from report in Plant Disease Survey files

A – J. F. Adams, Delaware
An – H. W. Anderson, Illinois
B – J. T. Barrett, Illinois
Ba – M. R. Barrus, New York
Br – J. T. Bregger, Michigan
Bs – H. P. Barss, Oregon
C – M. T. Cook, New Jersey
Ch – Charles Chupp, New York
Cr – R. F. Crawford, New Mexico
E – J. A. Elliott, Arkansas
Ev – Paul Evans, Missouri
F – F. D. Fromme, Virginia
Fi – F. D. Fisher, Washington
Fr – E. M. Freeman, Minnesota
Fu – H. R. Fulton, North Carolina
Fu' – H. R. Fulton, Pennsylvania
G – N. J. Giddings, West Virginia
Ga – M. W. Gardner, Indiana

H&D – F. D. Heald and B. F. Dana, Washington
Hr – L. R. Hesler, Tennessee
Hu – C. W. Hungerford, Idaho
J – L. R. Jones, Wisconsin
Je – H. M. Jennison, Montana
M – W. E. Maneval, Missouri
Ma – W. W. Magill, Kentucky
Mc – T. H. McHatton, Georgia
Minn. – Sect. Pl. Path., Minnesota
N – J. B. S. Norton, Maryland
Np – Robert S. Northrop, Utah
O – C. R. Orton, Pennsylvania
Ow – C. E. Owens, Oregon
P – L. H. Pammel, Iowa
R – H. S. Reed, Virginia
Rd – G. M. Reed, Missouri
S – E. C. Stakman, Minnesota

Sk - E. A. Stokdyk, Kansas
Sl - W. L. Shovell, Montana
T - A. G. Tolaas, Minnesota
T&A - L. R. Tehon and W. W. Anderson, Illinois
Te - C. E. Temple, Maryland
V&M - W. D. Valleau and W. W. Magill, Kentucky
Vn - R. E. Vaughan, Wisconsin

Recent literature:

Chambers, E. L. Apple fire blight reduced in Dunn County campaign. Wisconsin Dept. Agr. Bul. 52: 70-72 (1922) 1923.

Orton, C. R. Relation of the so-called winter injury at the collar of apple trees to fire blight. Proc. State Hort. Assoc. Pennsylvania 64: 36. 1923.

Fruit spot caused by *Phoma pomi* Pass.

In 1923 Brook's fruit spot was reported from Massachusetts, southeastern New York, New Jersey, Delaware, eastern West Virginia, Arkansas, southern Ohio, and Missouri. In West Virginia it was said to be more important than usual; otherwise it was reported as less prevalent, or at any rate not more so. According to E. F. Guba of New York fruit spot is usually the major disease of apples in the Hudson Valley, but there was almost none observed in that section in 1923. In Pennsylvania, where this disease often becomes important, it practically disappeared in 1923. The loss for New York was estimated as ranging from a trace to one percent, and in West Virginia at two percent.

W. E. Maneval reported that in Missouri, according to Mr. Neely Turner, "Senator is immune, Jonathan very susceptible, Ben Davis, York Imperial, and King David moderately susceptible." (See Orchard Survey in Missouri, p. 88). Baldwin, Tolman Sweet, and Yellow Bellflower were said to be especially susceptible in New York. Jonathan was reported affected in Delaware and in Arkansas, where V. H. Young stated that over fifty percent infection was noted in one block of this variety. Other varieties attacked were Grimes Golden and Winesap in West Virginia and Rome Beauty in Ohio.

Recent literature:

Brooks, Charles, Phoma fruit spot of apples. Am. Fruit Growers Mag. 44: Feb. 1924.

Thomas, R. C. A new fruit spot of apple, Brook's spot. Mo. Bul. Ohio Agr. Exp. Sta. 8: 91-96. 1923.

Powdery mildew caused by *Podosphaera leucotricha* (E. & E.) Salm.

Powdery mildew of apple was reported from New York, Pennsylvania, Delaware, Virginia, Ohio, Indiana, Minnesota, Iowa, Missouri, Colorado, Arizona, Idaho, and Washington. As a rule it was said to be of little importance, even less than usual in most of the eastern states where it is not ordinarily considered to be economically significant. Fromme reported that in Virginia it was severe locally, but caused slight loss for the state as a whole. In Colorado, according to Learn, powdery mildew did some damage in Delta and Mesa Counties in the early part of the year (see Pl. Dis. Reporter 7: 18, July 1, 1923), Hungerford stated that it was quite prevalent in unsprayed orchards in Idaho.

Fromme reported that differences in varietal susceptibility were marked. "Mammoth Black Twig showed 50% of the blossoms affected; none on Winesap and Red June nearby. Also found on Pinnox Red and Rhode Island Greening." In Pennsylvania it is most commonly found on Jonathan.

Recent literature:

Cunningham, G. H. Powdery mildew, Podosphaera leucotricha (E. & E.) Salm. Its appearance, cause and control. New Zealand Jour. Agr. 26: 344-351. 1923.
Höstermann, G., and K. Noack. Die Bekämpfung des Apfelmehltaues. Deut. Obstb. Zeit. 69: 162. May 25, 1923.

Crown gall caused by Bacterium tumefaciens E. F. S. and Towns.

Crown gall was reported as being on the increase in Minnesota and Iowa. In the latter state a loss of 35 percent of the nursery stock is reported by Melhus. In general the reports come from nurseries, where inspection indicates high percentages of infection, especially in those regions where dry conditions aggravate the physiological disturbances brought about by crown gall. The aerial swellings, which have been usually termed "aerial crown gall," were reported from New Jersey, Ohio and Missouri.

Miss Brown (1) has recently thrown some doubt upon the etiology of the aerial tumors found on apple stems. Failure to isolate the organism out of material from various parts of the United States and the apparent association of wooly aphis with these types of tumors has led her to hypothecate this insect as the causal organism, rather than B. tumefaciens.

The symposium on crown gall, held at Cincinnati, has attracted considerable attention and a report of the crown gall committee which was approved by the American Phytopathological Society and the Society of Economic Entomologists, will be published in Phytopathology and other journals. The recommendations materially alter the status of the disease from the standpoint of the nurserymen and inspectors and reopen a field for further researches upon the importance and control of this disease.

One severe case of infection was reported in Arizona by Brown, as following planting of apple on the site of a diseased mesquite forest with resulting loss of 1-1/2 acres. The condition as regards the presence of crown gall on the trees at time of planting was not stated.

Varietal susceptibility:

Early Harvest) (McBride
Early May) ..more susceptible in Mississippi than ..(Delicious
Yates) (Red June

Wealthy)
Duchess) 50 percent infected in Illinois nurseries
Transparent)

Ben Davis)
Gano) Quite susceptible in New Mexico
Rome)

APPLE - Sooty blotch and flyspeck

Recent literature:

Cited

1. Brown, Nellie A. An apple stem tumor not crown gall. (Abstract) Phytopath. 14: 29-30. Jan. 1924.

Not cited:

Anon. Galls on crowns of apple trees. Jour. Dept. Agr. South Africa 7: 198. 1923.

Sherbakoff, C. D. Crown gall control in the nursery. Proc. Tennessee State Hort. Soc. 17: 74-77. 1922.

Sooty blotch and flyspeck caused by *Phyllachora pomigena* (Schw.) Sacc. and *Leptothyrium pomi* (Mont. & Fr.) Sacc.

These diseases were reported from a number of states east of the Mississippi River and from Missouri and Kansas. In most cases they were said to be unimportant, but in a few states the damage caused by one or both was appreciable, as is indicated in the reports quoted below. They are invariably most prevalent in shaded, damp or low situations where the air drainage is bad.

M. W. Gardner reported that the flyspeck fungus was found on the bark of a young apple limb in Indiana, February 8.

Besides the varieties mentioned in the reports quoted; sooty blotch was reported on Ben Davis, Grimes Golden, and Missouri Pippin in Illinois, and Baldwin in Connecticut; and flyspeck on Ben Davis and Missouri Pippin in Illinois.

Delaware: Sooty blotch and flyspeck more generally prevalent than last year. The disease became conspicuous in Sussex County the first part of September. Most severe where the July and August sprays were omitted. Many growers with prospects of No. 1 fruit in July had cull apples to harvest in September because of their failure to apply a late spray. Many orchardists applied dust in August with very effective results where if spraying only was possible the fruit would have been neglected. A rainy period of three to four days duration the last of August appeared to favor the establishment of the disease. (Adams)

Virginia: Cloud (*Gloeodes pomigena*) always troublesome in poorly sprayed orchards. Loss for state 2%. Flyspeck much less prevalent than cloud; loss caused 0.5%. (Fromme)

Indiana: Sooty blotch very serious this year; worse than usual or than last year; caused a reduction in value of apples of 0.2%. Statewide; worse in southern half. Appeared first during last week in September; favored by rains of September 19-21. Greatest damage done to Grimes, produced excess of second grade where grading was close. Most serious on shaded lower branches and on north slopes. (M. W. Gardner)

Missouri: Sooty blotch; Lady and Huntsman very susceptible, according to reports; Jonathan variable; Grimes Golden, Winesap, Gano, Ben Davis, and Delicious affected to a less degree. (W. E. Maneval)

Recent literature:

Anon. An apple disease. - First record in South Africa. Jour. Dept. Agr. South Africa 6: 381. May 1923. (Leptothyrium pomi)

Root rots caused by various fungi

Black root rot caused by Xylaria sp.

New York: Xylaria sp. caused a loss of 0.2%. Often found in western New York in old orchards. R. G. Palmer, assistant county agent of Monroe County, reports infection of 35% and 50% of Twenty Ounce apples respectively in two orchards, some trees dead. (Guba)

Virginia: (X. digitata) The most important root disease in the state; caused a loss of 1%. Generally distributed; apparently does not vary in severity from year to year. Northern Spy roots are holding up nicely in experimental tests. (Fromme)

Illinois: (Xylaria sp.) Serious in young orchards in Johnson County; some in Union County. (Tehon & Anderson)

Root rot caused by Armillaria mellea (Fr.) Quelet

Alabama, Wisconsin, and Iowa reported Armillaria root rot as occurring locally. According to L. E. Miles, in Alabama, "In one orchard planted in new ground ten percent of the trees were affected."

Root rot caused by Ozonium omnivorum Shear

Texas: Texas root rot by far overshadows all the other apple diseases in the black waxy lands. In fact, this is one serious limiting factor which practically prevents apple growing in these lands. The small percentage of apples grown in the state are mostly found in eastern Texas where the land is more or less of a light loam and where root rot is practically absent. (Taubenhaus.)

Root rots (cause undetermined)

A root rot which may have been caused by a Basidiomycete was prevalent in the eastern part of Oklahoma, and caused considerable loss, according to Stratton. In Indiana M. W. Gardner reported a root rot of unknown cause as occurring on "young Winesaps on newly cleared land. Not present in orchards planted on old farm land." An undetermined root rot was reported from Ohio also.

Silver leaf caused by Stereum purpureum Pers.

While silver leaf has been reported to the Survey from a number of states during preceding years, there has always been some doubt expressed as to the cause of the disease, and winter injury has usually been indicated as the main factor in its occurrence. In 1923 silver leaf caused by Stereum purpureum was reported from Washington by Heald and Dana, who stated that 1923 was the first year that authentic specimens of the fungus had been received. Heald reported further (Dec. 18):

> "I think there is no doubt that this disease is increased in severity by winter injury, but we have found that the trouble was really prevalent in the Spokane Valley for quite a number of years previous to the freeze of last winter.
>
> "From the work which has been carried on up to the present time, it seems to be very widely distributed in the Spokane Valley and probably extends all the way northward to the Canadian boundary. We have no experimental data as yet showing whether perfectly normal apple trees will be attacked by the silver-leaf fungus, but it seems from the experience with the disease in other parts of the world, that the fungus can develop in perfectly normal trees."

D. F. Fisher made the following statement regarding the severity of the disease in an orchard at Cashmere, Washington.

> "Some of the trees produced a few apples this year but they did not mature. The injury appeared to be more on the larger branches and on the trunks than in the small wood of the tops. The bark on the heavy wood was discolored and rotted all the way around and on the trunks to the ground line.
>
> "The grower states that the foliage, such as there was, this year was all silvered in the badly injured section, and now nearly every tree and every injured area on living trees in the other sections is covered with the fructifications of a fungus that Heald has identified as Stereum purpureum. That is, he so identified similar material from some Spokane orchards." (From a letter to M. B. Waite, Dec. 4)

The disease was also found in Tompkins County, New York, and determined as due to Stereum purpureum by E. E. Honey.

Mosaic

The following interesting report of the occurrence of a mosaic disease of apple is from New York.

> "Collected at Ithaca May 16, by F. M. Blodgett; at LeRoy, Genesee County, on the Walbridge variety, by E. F. Guba, August 23. Dr. F. M. Blodgett was able to transmit this disease, which is evidently mosaic, by means of grafting, using material collected in Tompkins County." (Guba)

Bitter pit (non-parasitic)

Bitter pit was reported from most of the Atlantic Coast states from Massachusetts to Virginia, from West Virginia, Ohio, and Indiana; and from Idaho, Washington, and California. In Massachusetts, West Virginia, Ohio, and Indiana it was said to be more prevalent than usual, and to be serious at least in some localities or on certain varieties. In most other cases, it was apparently not important, although Virginia reported some loss.

In Indiana, according to Gardner, the disease was "most serious and widespread on Grimes; serious on Stark; present on Mayer, Baldwin, Esopus, Stayman, McIntosh." Other states reported the following varieties as affected; Massachusetts - "Serious on Baldwin." (Osmun); Delaware - York Imperial, Nero, Rome Beauty (Adams); Virginia - "Especially on Grimes and York" (Fromme); West Virginia - "Bad on York Imperial, Baldwin, King David, and the Winesaps." (Sherwood and Giddings).

The following quotations are of interest:

Ohio: Fruit on young trees with light crops show greatest injury. (R. C. Thomas).

Indiana: Cullinan suggests that the dry spring followed by a wet summer favored the disease. (Gardner).

Kidd and West (1), who have been working in England on the cause of the "brown heart" of apples and pears, prevalent in shipments from Australia, found that during some of their experiments "in which brown heart was artificially produced under the influence of carbon dioxide and reduced oxygen concentrations in the storage atmospheres," there was also developed an abnormal condition remarkably like bitter pit. They suggest, therefore, that bitter pit may be caused by a temporary excess of carbon dioxide "beyond the danger limit in the internal atmosphere of the apples affected," such as might be produced in apples on the tree by the lowering of the temperature when a cold night follows a hot day. It was found by the authors that this danger limit is lower when the temperature is low, and it had been shown previously that "the carbon dioxide and oxygen conditions in the internal atmosphere at higher temperatures are well within the range" which may cause brown heart at lower temperatures.

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Miscellaneous diseases and injuries

Leafspot caused by *Coniothyrium pyrinum* (Sacc.) Shel. was collected at Central Bridge, Schoharie County, New York, August 30. Chupp and Guba state that this leafspot, following frogeye, was "severe on one McIntosh apple tree causing defoliation and yellowing of the leaves. According to the grower, this same disease has been present on the one isolated tree for several years. No other fungus present."

Brown rot caused by *Sclerotinia cinerea* (Bon.) Schröt. - Alabama, Oklahoma, Indiana, Iowa, California; not important in any case. Mel. T. Cook (1) made isolations from Stayman Winesap apples for the purpose of securing cultures of Glomerella rufomaculans, but found that in nearly every case the rot was due either to Sclerotinia or Botrytis.

Rot caused by Botrytis sp. - Washington.

Rot caused probably by Phytophthora cactorum Schröt. - Indiana. According to Gardner, the disease appeared July 18 at Lafayette on the same trees as in 1921 (see Pl. Dis. Bul. Suppl. 20: 53. June 10, 1922). "It was worst on Grimes, on low hanging fruits and drops in low wet spots in orchards. A Bordeaux spray was applied and no further trouble resulted. It was noted in October on Grimes and Ben Davis drops in Miami County."

Die-back caused by Valsa leucostoma (Pers.) Fr. was reported as common, associated with or following fire blight or winter injury, in New York and Nevada. It was of some importance on nursery stock and young trees in the former state.

Brown bark spot, cause unknown, was reported from Washington, and from Indiana as follows:

> "Burkholder suggests it may be associated with poor soil drainage. In 1921 this disease was found on Champion in Brown County. Specimens were sent to Morris in Montana, who pronounced it the same as their disease described as brown bark spot. This year it was sent in from Spencer County." (Gardner)

Collar rot, cause unknown, mostly on Grimes, in Ohio and Indiana. In the latter state, according to Gardner, the trouble is now "avoided by using double worked nursery stock."

Scald (non-parasitic) was reported from a very few states, but probably occurred much more widely. According to a statement issued by the American Association of Ice and Refrigeration (5), "Approximately 12,000,000 boxes of apples that went into storage last fall (1923) were wrapped in oiled wrappers for the prevention of loss from apple scald."

Other parasitic diseases reported were Cercospora mali Ell. & Ev. causing leafspot in Texas; Phyllosticta sp. on leaves and fruit from New Jersey; blue mold rot caused by Penicillium expansum (Lk.) emend. Thom.; spongy dry rot caused by Volutella fructi Stevens & Hall, from New York, West Virginia, and Indiana; fruit rot caused by Fusarium sp. from Washington; Neofabraea malicorticis (Cord.) Jackson from Washington; Cytospora sp. from New Mexico, Washington, and Oregon (11); Myxosporium corticolum Edg. (2, 3) from New York and Pennsylvania; Nectria galligena Bres., New York and Oregon (8, 9, 12); Daldinia concentrica (Bolt.) Ces. & De Not., Washington; Daedalea confragosa (Bolt.) Pers., New York; Septobasidium sp., Alabama and Louisiana; Polystictus versicolor (L.) Fr., New York and California (important in some cases); Schizophyllum commune Fr., New York.

Various other non-parasitic troubles were reported, mostly as unimportant. H. W. Anderson reported that in Illinois an unusual type of soft scald caused considerable loss to apples, especially Jonathans, in storage. Jonathan spot was reported from New York, New Jersey, Ohio, Indiana, Iowa, Idaho, Washington, and California; water core from New York and Arkansas; drinkle from Minnesota; internal breakdown from Idaho; cork, tan disease, fasciation, niter burning, and alkali injury from Washington; rosette(5) from Delaware (associated with drouth) and Idaho; measles from New Mexico. References 4, 7, and 10 give the results of work on the causes and control of brown heart and internal browning of apple fruits.

APPLE - Miscellaneous diseases

Injury due to weather conditions was reported as follows: drought spot, Arkansas (York Imperial, Shannon Pippin, and Mammoth Pippin), Idaho, Washington; drought injury (defoliation of trees), Missouri; skin crack, Virginia (apparently from rapid expansion following rainfall in August after prolonged drought. Growers have often thought this spray burn), Michigan; sunscald, scorch, or burn of fruit, Connecticut, New York, New Jersey, Delaware, Missouri; early drop, Virginia (an unusually severe early drop which involved as high as 85 percent of the total set was recorded in the Upper (Shenandoah) Valley of Virginia. Thought to be due to the 8° above zero weather in late March - Schneiderhan); hail injury, Connecticut, Iowa; frost injury, Connecticut, Delaware, West Virginia, Ohio, Indiana, Illinois, Iowa, Washington; winter injury, Connecticut, Ohio (serious upon young trees of Hubbardston, Rome, Jonathan, and Baldwin; apparently traceable to freezes of early December, 1922 - Thomas), Wisconsin (more than the usual amount. Stunting of trees and yellowing of foliage were the common symptoms in the northern section. The trouble appeared to be confined largely to the Northwestern Greening and associated with bad drainage - Vaughan), Minnesota (of less than the usual importance; mostly of sunscald type on branches and trunk - Sect. Pl. Path.), Washington (widespread and important in eastern part - Dana).

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   (The disease was first discovered in England in 1920, at Long Ashton, and subsequently in a nursery at Sandford. Although it has been considered to be only a weak parasite in the United States, the damage in England was severe; however trees that are attacked are usually in a weak condition.)
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Orchard surveys

Virginia:

Apple disease survey, Crozet, Virginia, 1923. See table 13

Apple Disease Survey, Crozet, Virginia. 1923

Table 13. Data by R. H. Hurt from 33 orchards; 14 of Winesap, 12 of Albemarle Pippin, 3 of York Imperial, 3 of Ben Davis and 1 of Stayman. Fruit infection only.

Disease	Winesap			Pippin			York		
	Percent infected orchards	Maximum percent infection	Average percent infection	Percent infected orchards	Maximum percent infection	Average percent infection	Percent infected orchards	Maximum percent infection	Average percent infection
Scab	86	2.6	0.7	8	t	t	33	0.3	0.1
Cedar rust	0	0	0	8	t	t	0	0	0
Bitter rot	36	t	t	92	8.0	1.1	100	2.5	1.8
Blotch	0	0	0	42	2.0	0.3	0	0	0
Black rot	0	0	0	0	0	0	0	0	0
Fly speck	29	5.0	0.8	0	0	0	0	0	0
Cloud	36	5.0	0.6	0	0	0	0	0	0
Stippen	100	3.0	1.6	100	8.0	3.5	100	5.0	4.3
Drought crack	7	5.6	0.4	100	60.0	52.7	33	0.5	0.2
	Ben Davis			Stayman			All varieties		
Scab	100	1.0	0.3	--	--	0.5	45	2.6	0.9
Cedar rust	33	t	t	--	--	0	6	t	t
Bitter rot	100	2.0	0.6	--	--	0	71	8.0	0.7
Blotch	0	0	0	--	--	0	16	2.0	0.1
Black rot	0	0	0	--	--	0	13	t	t
Fly speck	0	0	0	--	--	0	13	5.0	0.4
Cloud	0	0	0	--	--	0	13	5.0	0.3
Stippen	66	2	1	--	--	5.0	99	8.0	2.6
Drought crack	33	t	t	--	--	0	42	60.0	14.0

Apple Disease Survey, Frederick County Virginia, 1923

Table 14. Data by F. J. Schneiderhan and R. H. Hurt from 23 orchards; 8 of Ben Davis, 8 of Stayman, 2 of York Imperial, and one each of Jonathan, Northwestern Greening, King David, Winesap and Rome.

Disease	Percent infected orchards	Maximum percent infection	Average percent infection	Data from cull piles at vinegar plants. Average percent infection.
Scab	48	56.5	3.9	2.3
Cedar rust	39	1.5	0.3	0.2
Bitter rot	26	100.0#	0.4	0.6
Blotch	0	0	0	0.1
Black rot	20	2.5	0.4	0.5
Fly speck	0	0	0	0.4
Cloud	39	20.5	1.5	5.7
Stippen	48	7.3	1.5	13.0
Drought crack	39	30.0	1.7	8.3
Codlin moth	87	57.5	8.0	20.4
Curculio	87	11.0	1.8	7.1
Aphis	56	16.5	3.1	11.0
Scale	61	41.0	4.4	13.0
Leaf roller	52	2.5	0.5	2.4

# This case is omitted from the averages as only a few trees were affected.

Missouri:

During October and November Mr. Neeley Turner, of the extension department of the University of Missouri, inspected apples in various parts of the state. According to his records the following were the worst cases of loss from infections of fungi on fruit. The data are for 34 orchards containing 1668 acres in 12 counties (Andrew, Barry, Buchanan, Carroll, Cooper, Greene, Jackson, Jasper, Lawrence, McDonald, Newton, Platte). At least 20 of these orchards were sprayed pretty thoroughly (4 to 7 times).

The worst diseases on the fruit in these orchards were scab in 2, blotch in 17, sooty blotch in 6, bitter rot in 1, Phoma spot in 6, and rust in 1. In the 12 orchards in which there was the most blotch the percentage of blotched apples varied from 10 to 90 percent and averaged about 35 percent. The highest percentage of scabby apples was from 2 to 5 percent. In 1 orchard (10 acres) in which Jonathan was the main variety 100 percent of the fruit was affected with sooty blotch and fly speck, and in general sooty blotch was common and infections heavy. The highest percentage of bitter rot reported was 4 percent. In 4 orchards from 15 to 50 percent of Phoma spot was found. This was in Lawrence and Green counties. Phoma spot, it seems, has been unusually abundant this year and has received considerable attention.

Blotch was severe on fruit of Huntsman, Ben Davis, Jonathan (25 percent highest), Grimes, Delicious, Ingram (50 percent highest), Winesap, Paine's (90 percent highest) and Gano.

Sooty blotch was reported worst on Jonathan (1 case of 100 percent), Ingram (10 percent) Huntsman, Lady and Ben Davis.

Phoma spot was found on 25 to 50 percent of fruit in some cases on Jonathan and Ben Davis.

Most of these 34 orchards varied in age from 20 to 30 years. (W. E. Maneval. 1923)

PEAR

Fire blight caused by Bacillus amylovorus (Burr.) Trev.

Pear blight is coextensive with the pear industry and the reports for 1923 indicate that the disease was fully as prevalent as in 1922 when there was a very conspicous increase over the two previous years. In a few states such as Connecticut, Pennsylvania, West Virginia and Wisconsin the collaborators report the disease as being of less importance than in 1922, but all the other reporters indicate as severe an outbreak or else a heavier infection than in 1922. In California Milbrath states, "There are few orchards in the diseased areas which did not have some blight. In some orchards all trees were severely infected. The loss in the state was about $2,000,000 based on removed trees, severely pruned trees and crop reduction. In Sacramento County out of 1,000,000 trees 30,000 were removed." In a number of states such as Kentucky, North Carolina, Florida, the Gulf States, Arkansas, New Mexico, Arizona, Utah, Idaho, and California, blight is considered the limiting factor in the cultivation of the pear.

Only a few estimates of losses in percentages were reported, but these are given for the purpose of showing the general importance of this disease.

Table 15. Percentage losses from pear blight in 1923, as estimated by collaborators.

State	Percent	State	Percent
New York	15	Mississippi	40
Virginia	2	Texas	5
West Virginia	4	Arkansas	60 - 75
Kentucky	50	Indiana	6
North Carolina	20	New Mexico	15

Varietal susceptibility and control:

The Bartlett and Clapp's Favorite are as usual reported as very susceptible. Kieffer is also reported as being rather susceptible in New York and Illinois. In Alabama the sand pear is the only resistant one but even it shows some twig blight. In Georgia and Florida, Rimes' Pineapple pear has shown marked evidences of being immune (1,2,7,9). In these states considerable work is under way on this interesting variety, which was reported by R. D. Rimes (7) as having originated in his orchard near Ludowici, Georgia. The original parent tree is now 43 years old and is vigorous and produces heavy annual crops.

During these years it has been close to other varieties such as LeConte and Kieffer, which have blighted badly. Attempts to infect this pear have failed. It is called the Pineapple pear on account of the pineapple-like odor.

At the Southern Oregon Substation the principal work is in connection with the study of blight resistance in pears (3,5,6). A. C. McCormick reports as follows (5):

> "Seedlings of *P. ussuriensis* have in some cases been planted directly in the orchards and there top-worked to the standard pear varieties. This procedure is, however, not to be generally recommended because we know the logical place to graft two distinct species is at the crown. We know, too that to top-work seedlings requires a great amount of individual attention on account of the variation in habit of growth of seedling stock. Therefore, it has been found necessary to develop resistant varieties which form the trunk and main limbs of the disease resistant trees. In this way the tops of the trees are standardized. Through inoculation experiments there were found two varieties of *P. communis* which were practically immune to blight, Old Home and Estella, and two or three cultivated varieties of *P. ussuriensis* chief among which are Chief Li and Hsiang Sui Li. These varieties when grafted on Chinese roots and top-worked to our standard commercial pear varieties give the pear grower a tree with the roots, trunk and main limbs immune to the ravages of pear blight. Practical pear growers estimate that these trees when top-worked will be 75 to 90 percent proof against the disease. This means that the disease will be confined in the commercial variety, to the tops of the trees, where it may readily be discovered and eradicated."

According to Root (8): honey bees are not the chief carriers of fireblight, and if they do carry blight to a limited extent their value in pollination offsets many times any possible damage they may do as disease carriers.

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Scab caused by Venturia pyrina Aderh.

Pear scab was apparently distributed generally over the areas where pears are grown. It was of more than usual importance in Illinois, Wisconsin, Washington, and California. More generally it was reported to be of less or of average importance. In Genesee County, New York, pear scab appeared to be of unusual importance, Bartlett showing 50 to 60 percent of fruit infection. In other orchards Flemish Beauty was about the only one conspicuously attacked but in neglected orchards all varieties were more or less susceptible (Chapman). The disease was prevalent in Western Washington (Heald & Dana); also in California where 1 percent loss was estimated (Milbrath).

Dates of first observation:

June	14	Kenosha, Wisconsin
"	12	Wayne County, New York
"	13	Concord, New Hampshire
"	28	Mt. Gilead, Ohio

Other diseases

Leaf blight caused by Fabraea maculata (Lev.) Atk. was reported from Connecticut, New York, New Jersey, Delaware, Alabama, and Illinois. Adams estimated a loss of 5 percent as due to this disease in Delaware, which was apparently the only state where it was of any importance.

Leafspot caused by Mycosphaerella sentina (Fr.) Schröt. was reported from New York, New Jersey, Virginia, Georgia, Alabama, Oklahoma, and Illinois. Varieties affected were Sheldon, Seckel, and Bartlett in New York, Pineapple in Georgia, Kieffer and sand pear nursery stock in Alabama.

Sooty blotch caused by Phyllachora pomigena (Schw.) Sacc. was reported from New York, Delaware, and Indiana, and from Illinois for the first time.

Diseases caused by Septobasidium spp. were reported as follows: girdle caused by Septobasidium sp. from Louisiana; canker caused by S. retiforme (B. & C.) Pat. from Florida, Alabama, and Texas; canker caused by S. pedicillatum (Schw.) Pat. (felty fungus), from Florida and Mississippi.

Corticiumstevensii (Noack) Burt was reported by Weber as destructive, causing 50 percent defoliation, on a few old trees at Gainesville, Florida. The disease attacked the leaves and twigs. "The leaves were killed rapidly and turned black, clinging to the tree as in fire blight."

Other parasitic diseases reported were sooty mold cause Torula sp. from Illinois; powdery mildew caused by Podosphaera sp. from Colorado;

twig blight caused by Phoma ambigua (Nitz.) Sacc. from Florida; root rot caused by Ozonium omnivorum Shear from Texas and Arizona; crown gall caused by Bacterium tumefaciens EFS. and Towns., New Mexico and Arizona. Fruit rots were reported as due to Sclerotinia cinerea (Bon) Schröt. in Mississippi and Illinois; Physalospora cydoniae Arnaud in Alabama (on fruit in transit) and Arkansas; Botrytis sp. and Rhizopus nigricans Ehr. in Washington.

Winter injury and drought injury were reported from Washington; frost injury and russeting of the fruit due to frost from Ohio.

Other non-parasitic troubles reported include red leaf in New York; (Plant Dis. Reporter 7: 97. Oct. 1, 1923) "Apparently for the most part associated with poor soil and cultural conditions." (Guba); black leaf and black end in California; stoniness, rough bark, and alkali injury in Washington.

QUINCE

Fire blight caused by Bacillus amylovorus (Burr.) Trev. was reported as the most destructive disease of quinces in New York, where it caused a loss estimated at 12 to 15 percent. Other states where it was important were Delaware, Illinois (loss 0.5%), and Massachusetts. It was reported also from Connecticut, New Jersey, Pennsylvania, Texas and Ohio.

Leaf blight caused by Fabraea maculata (Lév.) Atk. was reported from Connecticut, New York, Delaware, West Virginia, South Carolina, Alabama, Indiana, and Illinois. In most of these states it was of some importance locally. Losses due to it were estimated at 5 percent in West Virginia, 4 percent in New York, and 0.5 percent in Illinois.

Rust caused by Gymnosporangium germinale (Schw.) Kern – Reported from Massachusetts, Connecticut, Pennsylvania, Alabama. Osmun (Massachusetts) stated that "Dry weather during the normal period for the dissemination of basidiospores probably accounts for the relatively small amount of infection."

Other diseases and injuries reported were hairy root due to Bacterium tumefaciens EFS. & Towns., Washington; bitter rot caused by Glomerella cingulata (Stonem.) S. & von S., West Virginia; brown rot caused by Sclerotinia cinerea (Bon.) Schröt., West Virginia; frost injury from Washington.

DISEASES OF STONE FRUITS

PEACH

Brown rot caused by Sclerotinia cinerea (Bon.) Schröt.

Brown rot of peach was widely distributed as usual, being reported from Massachusetts south and west to Georgia, Texas and Kansas; also in California and New Mexico.

In the northeastern United States brown rot caused much loss loss except in Delaware and eastern Maryland where it was more severe than in 1922. The

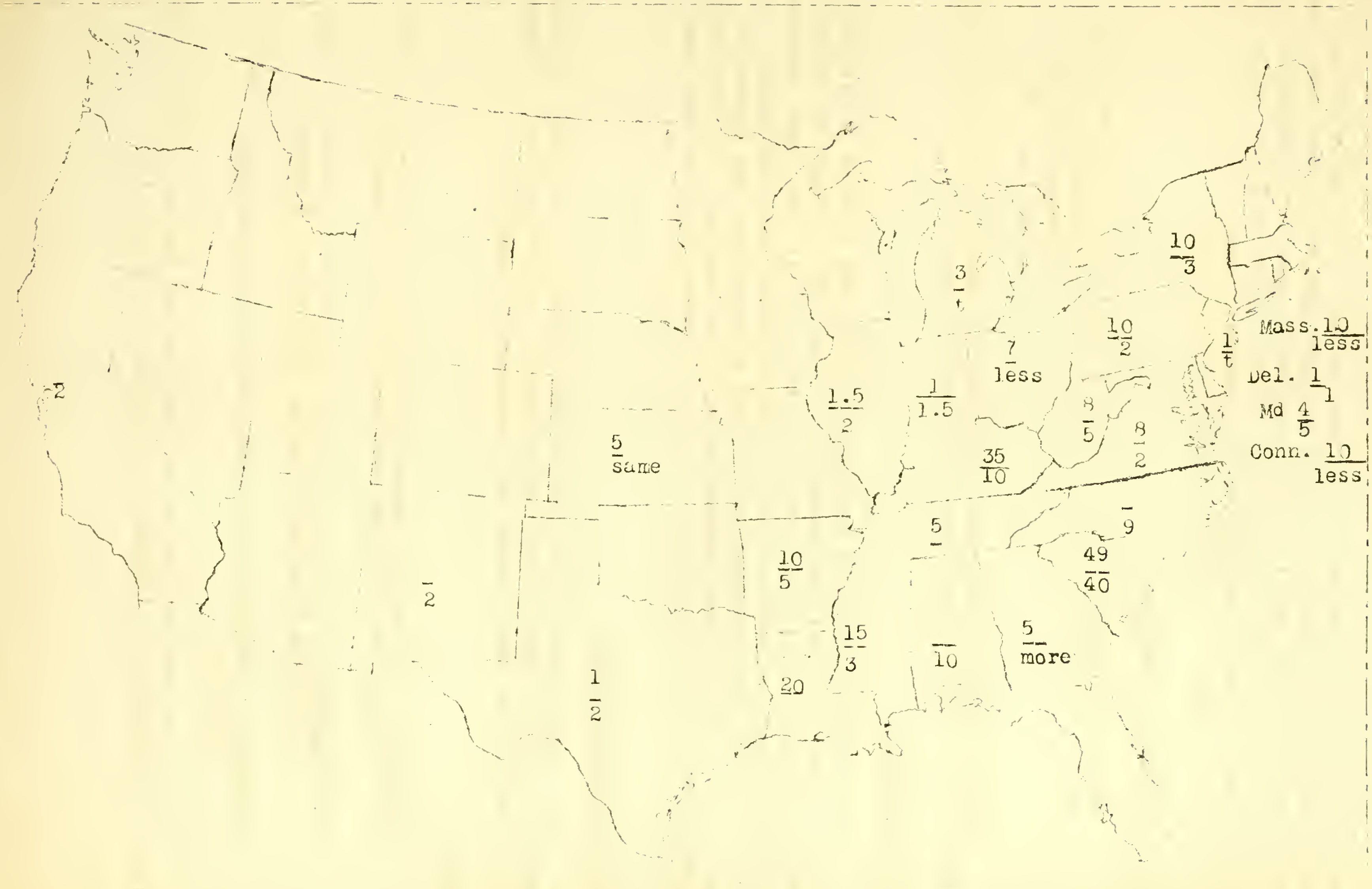

Fig. 4. Percentage losses from brown rot of peach in 1923 (lower figure) as compared with 1922 (upper figure).

disease was also less prevalent in the more northern peach areas of Ohio and Michigan, but from Kentucky to Illinois and southward the disease was generally of more importance than usual, with the possible exception of Arkansas where the loss was considerably less according to the reports from that state. In New Mexico and California the disease was important locally and it is estimated that a loss of 2 percent occurred in each of these states.

Dates of earliest appearance:

March 28	(blossoms)	Fort Valley, Ga	June 5	Hamilton Co., Ill.
May 4	(fruit)	" " "	" 16	Bridgeville, Del.
" 24	....	Seneca Co., N. Y.	" 19	Cheshire, Conn.
" 29	....	Pickens, S. C.	" 26	Clark Co., Miss.

Blossom blight was reported from New York, Maryland and North Carolina and twig blight from New York, South Carolina and Ohio.

Weather relations:

It is apparent that the incidence of brown rot in 1923 is closely related to the rainfall over the peach areas. Where the disease was of less importance, as in the north and northeast, the rainfall was slight throughout the growing period and until after the ripening dates for early peaches. Most of the rot in this area occurred on the late peaches after the arrival of periodic rains. In the more southern areas the precipitation was more normal and, coupled with higher temperatures, much rot developed, especially upon the late crop.

Varietal susceptibility:

Hale, Early Elberta, and Elberta were reported susceptible in Delaware. (Adams). Uneeda was most susceptible in Georgia, but Yellow Hiley, Carman, Belle of Georgia and Elberta were also susceptible. (Dunegan).

Control:

Maryland: Fair control secured by spraying with self-boiled lime sulfur when the buds were pink. (Jehle & Temple)

West Virginia: Reduction in brown rot apparently correlated with reduction in curculio damage. (Sherwood & Giddings)

Kentucky: Self-boiled lime sulfur and dry mix gave good control. (Magill)

The use of hydrated lime on the soil appears to give results in preventing the development of apothecia, according to Ezekiel (1):

Table 16. Effect of hydrated lime on the growth of apothecia.

Pot number	$Ca(OH)_2$ in pounds per acre	pH after	
		1 day	14 days
1	125	6.81	6.55
2	625	6.65	6.65
3	5000	7.30	10.70
4	None (check)	5.99	6.40

Pot number	Development of apothecia after				
	1 day	6 days	10 days	14 days	20 days
1	-	-	trace	++	+++
2	-	-	-	--	-
3	-	-	-	--	-
4	++	+++	+++++	++	-

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Harrison, T. H. Note on the occurrence in New South Wales of the perfect stage of a Sclerotinia causing brown rot of fruits. Jour. & Proc. Roy. Soc. New South Wales 55: 215-219. 1922.

Norton, J. B. S. & W. N. Ezekiel. The name of the American brown rot Sclerotinia. Phytopath. 14: 31-32. Jan. 1924.

Leaf curl caused by *Exoascus deformans* (Berk.) Fuckel

Leaf curl was widely distributed from New Hampshire to California. In general it was reported as being somewhat more severe than during the previous ear and the losses during 1922 and 1923 were more than in 1921, but not so great s during the years of 1919 and 1920.

The total annual losses in the United States from leaf curl have been stimated, together with the average loss for five years, as follows:

PEACH - Leaf curl

1918	1919	1920	1921	1922	Average
.4	2.21	3.	.6	1.6	1.56

The following selected reports are typical for 1923:

Rhode Island: Leaf curl was abundant on all varieties, being severe even in some orchards which had received the dormant spray. (Browning)

New York: Particularly severe in counties bordering on Lake Ontario; prevalent all over state. Reported from 26 counties. (Guba)

Delaware: Greater prevalence than we have had for three years. (Adams)

Virginia: More prevalent than usual and general throughout the state. (Fromme)

Kentucky: Universal. Probably as severe as it can be. (Valleau)

South Carolina: Not important. (Ludwig)

Georgia: Peach leaf curl prevalent but not considered serious. Cool damp weather of spring favored the development of this disease which is not generally very common about Fort Valley. (Dunegan)

Mississippi: Damage slight except in unsprayed orchards. (Neal & Barker)

Oklahoma: More prevalent than usual. (Stratton)

Ohio: Rather less than last year. (Young)

Indiana: Much worse than last year. (Gardner)

Illinois: One of the worst outbreaks in years; 90 percent of the orchards infected. (Tehon & Anderson)

Iowa: More than usual. Spraying is not practical because trees are worthless. (Melhus)

Estimated losses from leaf curl in 1923:

State	Percent	State	Percent
New York	8	Mississippi	t
Delaware	1	Texas	t
Maryland	3	Arkansas	2
Virginia	0.5	Indiana	0.5
South Carolina	1	Illinois	3
Alabama	t	Iowa	4
		California	0.2

Dates of earliest appearance:

April 16	Webster Co., Miss	May 11	Bronx, N. Y.
" 24	Central, S. C.	" 23	Shipman, Va.
May 5	Orange Co., Ind.	" 25	Littleton, Mass.
" 6	Oklahoma	May	Haddam, Conn.
" 7	Germantown, Ohio	June 1	Rockingham Co., N. H.
" 9	Bridgeville, Del.	" 1	Wayne Co., Mich.

Varietal susceptibility:

Very few reports on varietal susceptibility and resistance were received. Fromme reports that "10 percent of shoots on Elberta and Carman at Blacksburg were infected while Early Crawford in the same orchard showed practically no infection." In Illinois, Belle of Georgia is said to be most susceptible; Elberta less so and Champion most resistant, according to Tehon and Anderson.

Control:

Good control was obtained where the dormant lime-sulfur spray was applied early enough to prevent infection. Early spring rains in New York and other states interfered with the dormant applications so that the control was generally not up to the usual standard. In Kentucky where the infection was very severe lime-sulfur 1-8 gave control where applied before March 15. (Valleau) In Illinois, Bordeaux oil emulsion does not seem to be as effective as lime-sulfur in controlling leaf curl. (Anderson)

The important lesson from the situation in 1923 is, "Do not omit nor delay the dormant spray on peaches; leaf curl infection takes place during the first swelling and cracking of the buds and failure to get on the dormant spray prior to this time means partial failure at least."

Recent literature:

Massey, L. M., and M. W. Fitch. Some results of dusting experiments for apple scab and for peach leaf curl in 1921-1922. Proc. New York State Hort. Soc. 1922: 42-60. 1923.

Mix, A. J. Biological and cultural studies of Exoascaceae. I. Exoascus deformans (Berk) Fuckel. (Abstract) Phytopath. 14: 35. Jan. 1924.

Weldon, Geo. P. Spring spraying of peaches with lime-sulfur. Monthly Bul. California Dept. Agr. 12: 44. 1923.

Scab caused by Cladosporium carpophilum Thüm.

Peach scab was of less importance than usual in the New England and Middle Atlantic States, except Delaware, where there was a denoted increase. In West Virginia, Kentucky and the South the disease was of usual importance and prevalence. In Ohio, Indiana, Illinois and Iowa scab was of more than usual importance because of the late infections.

New Jersey: Scab not as severe as in 1922 but usually present in most unsprayed orchards. In an orchard in Cumberland County, on Carman 62.2 percent of the fruit was infected, on Lola 38.5 percent and on Hiley 35.2 percent. In Atlantic County in one orchard, Greensboro, 75 percent was infected. (Wm. H. Martin)

Losses were reported as follows:

State	Percent	State	Percent
New York	1	Mississippi	1
Delaware	2	Texas	1
West Virginia	1	Arkansas	3
Kentucky	t	Illinois	0.5
North Carolina	3	Iowa	t
Alabama	2	Kansas	slight
		New Mexico	slight

Dates of first appearance:

April 7	Wayne Co., Miss.	July 28	Upper Valley, Va.
July 9	Logan Co., Ill.	Aug.	State College, N. Mex.
" 18	Bridgeville, Del.	Sept.	Ohio

The dry summer weather prevailing in the east was generally unfavorable, but in sections of the Ohio Valley the abundant late rains were favorable for the late appearance and rapid spread of the disease after spraying had been generally discontinued.

Very few reports on varieties were received. In Delaware June budded stock from a Tennessee nursery (900 trees) showed severe twig infection. In Illinois, Indian Red, Heath Cling, Hale, Elberta and seedling peaches were most affected.

Spraying was generally successful in controlling scab in 1923 due probably to the generally light infection. Lime-sulfur dust was reported as giving good control in Delaware. More attention than usual was given to spraying peaches in Ohio, with good results.

Bacterial spot caused by Bacterium pruni EFS.

The most important general observation regarding the bacterial spot is its almost constant association with neglected and uncultivated orchards. Undoubtedly it is often confused with a physiological leaf spot which is also associated with unfavorable conditions for the normal growth of the trees. In 1923 the disease appears to be of about the same general distribution and importance as in 1922. The following reports are of especial interest:

Delaware: As reported last year this was the most serious disease of the crop for 1923. In comparison with last year the prevalence of the disease was in the form of fruit infection, while last year leaf infection and defoliation was the situation. Leaf infection was observed in slight prevalence May 22 while fruit infection was first found June 22. The largest amount of fruit infection developed during July. Severe twig infection occurred along with the leaf infection last year. It was observed this year that the heavier fruit infection occurred on shoots which showed the greatest amount of twig infection. The infection around the leaf petioles from last year in two instances showed the presence of a fungus fruiting (Phoma persicae). This fungus has been reported as causing a die-back condition. The fertilizer experiments this year failed to produce any favorable results on control of the disease. Some fall spraying with Bordeaux mixture is being undertaken this fall to determine its effects on disease control. (Adams)

New York: In New York the disease was rather general where cultivation and fertilization are neglected. Often confused with other injuries. (Guba)

Alabama: Leaf and twig injuries rather common. Severe defoliation in some cases. Fruit spot observed in few cases. Loss probably less than 1 percent, though hard to estimate, when one considers the resulting lowered vitality of the trees. (Miles)

Mississippi: Date of first report May 26 - Lauderdale County. Damage serious resulting in partial defoliation of the trees. Also observed in Pearl River County on July 9. Damage very severe on the early varieties such as Greensboro, Carman, Mayflower and other early peaches. Many of these trees were about 75 percent defoliated early in July. (Sec. Pl. Path.)

Greatest injury on light, sandy soil with poor fertilization and care. (Neal & Barker)

Arkansas: Very common on leaves and less common on fruit in run down orchards. (Young)

Ohio: Most serious in neglected orchards. (Thomas)

Indiana: There is good evidence that disease is carried with nursery stock. The worst disease in commercial orchards. (Gardner)

Kansas: Common as usual. Very widespread wherever peaches are grown. Some twig cankers formed this season in addition to heavy leaf infections in some localities. (White)

Dates of first appearance:

Feb.	Clayton, La.	June 1	Orleans Co., N. Y.
April 9	Pearl River Co., Miss.	" 13	Marion Co., Ill.
May 20	Yavapai Co., Ariz.	" 18	Floyd Co., Ind.
" 22	Clemson College, So. Car.	July 30	New Brunswick, N. J.
" 22	Sussex Co., Del.		

Varietal susceptibility:

There appears to be considerable difference in the susceptibility of peach varieties to this disease. In New Jersey shot hole was severe on Elberta. In Mississippi such early varieties as Greensboro, Carman, and Mayflower were severely affected. In Indiana, Elberta was more susceptible than Hale. Very large fruit spots were produced on Red Bird Cling. Fruit infection was also severe on Elberta and Hale in Knox County, Indiana.

Indiana: In a plot containing 14 varieties in adjacent rows planted in 1920 in Lawrence County, Mr. H. E. Newland determined the rate of leaf fall on representative trees during the periods of August 3 to 4 inclusive, and August 15 to August 20 inclusive, and found the following average leaf fall per day per tree in the varieties:

Greensboro	34	Heath Cling	15	Captain Ede	10
Rochester	19	Belle of Georgia	11	Gold Drop	19
Crosby	12	Hiley	5	Krummel	12
Carman	6	Salway	20	Hale	9
Champion	23	Big Red	16		

The Elbertas were much larger than these and not comparable. (Gardner)

Nature of injury:

A considerable variety of symptoms were reported as follows:

Leafspot - New York, Delaware, Kentucky, South Carolina, Alabama, Texas, Arkansas, Ohio, Illinois, Kansas.
Shot hole - New Jersey, Virginia, South Carolina.
Defoliation - Massachusetts, Alabama, Mississippi, Ohio, Indiana.
Fruit spot - Delaware, Kentucky, Alabama, Arkansas, Indiana, Illinois.
Twig infection (cankers) - Delaware, Alabama, Texas, Kansas.

Control:

Indiana: In an experimental plot of young Elbertas in Lawrence County, a test of Na NO_3 applications has been made during 1922 and 1923 under the direction of F. P. Cullinan. Complicating factors prevent definite conclusion, but in general it appears that the deterrent effect of the Na NO_3 upon defoliation is not as great as was expected. At any rate, Na NO_3 alone cannot be considered insurance against the disease.

Mr. H. E. Newland ascertained the rate of defoliation on 18 representative trees in these plots during the nine-day period between July 26 and August 3, 1923, and found that single trees lost as many as 1226, 1340, 1538 and even 1846 leaves during the period mentioned. The lowest figure was 314. The average daily rate of leaf fall varied from 52 to 205 per tree, a condition which is really appalling and illustrates well the destructiveness of this disease. (Gardner)

Recent literature:

Roberts, J. W., and Leslie Pierce. The bacterial spot of peach. Trans. Illinois State Hort. Soc. 56: 78-87. 1923.

Crown gall caused by Bacterium tumefaciens EFS. & Towns.

Crown gall was reported from Connecticut, South Carolina, Alabama, Mississippi, Louisiana, Texas, Ohio, and Arizona. In Texas the loss is claimed by Taubenhaus to be 8 percent. In Arizona there were 800 trees killed in five counties; in Yuma County most of the trees dying have galls; in Greenlee County it is the most serious disease contended with; in Navajo and Apache counties it is found especially in the older orchards. (Brown)

Rust caused by Tranzschelia punctata (Pers.) Arth.

Rust was reported from Florida, Alabama, Mississippi, Texas and California.

Florida: Rust was collected during January, February, and March, and was found to be widespread and at that time serious, since it caused complete defoliation. It is probably of little economic importance. (Weber)
California: Reported as locally injurious to foliage in Sutter County. This is the most important canning peach section of

California and several varieties of yellow clings are grown in great quantity. Small slightly sunken spots form on the fruit, and in the most developed of these, urediniospores occur. Considerable injury by causing fruit to be spotted as it emerged from peeling. Much fruit rejected as canneries are not willing to pare off small spots. Lye peeling is said to be interfered with. (W. T. Horne)

Rust very severe in certain orchards in Sutter County. Loss in affected orchards 15 to 75 percent. (Milbrath)

Blight caused by Coryneum beijerinckii Oudem.

Coryneum blight was reported from Colorado, as less prevalent than usual; Utah, where it was especially severe in the Brigham peach district; Idaho (see Pl. Dis. Reporter 7: 29. July 15, 1923); eastern Washington, where it was common and rather severe in some unsprayed orchards; and California, where, according to Milbrath, it was "general throughout the state causing a loss of about 3 percent."

Literature:

Weldon, G. P. Spring spraying of peaches with lime-sulfur. Mo. Bul. California State Dept. Agr. 12: 44-47. 1923.

Rhizopus rot caused by Rhizopus sp.

Rhizopus rot was reported from Connecticut, "Chiefly on fallen fruit; a little damage where late peaches were left too long before picking." (Clinton); Delaware, "Very common this season where splitting of oversized fruit had occurred. Market reports indicate common prevalence in shipments." (Adams); Indiana, "Noted on drops in field; found in shipments." (Gardner)

Yellows and little peach (cause undetermined)

Yellows was reported from Pennsylvania, Delaware, Maryland, Virginia, Ohio, and New Mexico and a suspected specimen was received from Kentucky. Losses of 2 percent were reported from Maryland and New Mexico, and a trace from Virginia.

Little peach was reported from Pennsylvania and Delaware (see reports below).

The reports from Pennsylvania and from Delaware are of especial interest:

Pennsylvania: In 1923 peach yellows inspection was carried out by the Pennsylvania Bureau of Plant Industry, Department of Agriculture, in 14 counties in the southeastern part of the state, covering 417 orchards containing 482,614 trees. Of these trees 10,698 or 2.21 percent were marked for yellows (and little peach). The corresponding figures for 1922 were 14 counties, 422 orchards, 442,507 trees, 11,052 marked, or 2.5 percent.

Comparative records of yellows in trees of various ages in all the orchards inspected is as follows: 1 year old, none; 2 years, .38 percent; 3 years, .67 percent; 4 years, 1.62 percent; 5 years, 3.6 percent; 6 years, 4.61 percent; 7 years, 3.74 percent; 8 years, 4.96 percent; 9 years and older, 2.67 percent.

Of the 417 orchards inspected 86 or over 20 percent had no yellows; 187 or almost half had less than 1 percent; 301 or about three-quarters had less than 5 percent; 367 or about 6 orchards out of 7 had less than 10 percent; 30 had over 20 percent; and 6 had over 50 percent. (Summary of results of peach yellows inspection in Pennsylvania in 1923. W. A. McCubbin).

Delaware: Diagram (1) of orchard showing inoculations made with yellows (Y) and little peach (LP). (See Delaware quotation)

Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
2	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
3	LP	LP	LP	LP	LP		Y	Y	Y		Y	Y	Y		
4	LP	LP	LP	LP	LP		LP	LP	LP		LP	LP	LP		
5	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
6	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
7	LP	LP	LP	LP	LP		Y	Y	Y		Y	Y	Y		
8	LP	LP	LP	LP	LP		Y	Y	Y		Y	Y	Y		
9	LP	LP	LP	LP	LP		LP	LP	LP		LP	LP	LP		
10	Y	Y	Y	Y	Y		LP	LP	LP		LP	LP	LP		
11	Y	Y	Y	Y	Y		Y	Y	Y		Y	Y	Y		
12							LP	LP	LP		LP	LP	LP		
13							LP	LP	LP		LP	LP	LP		
14															
15															

The comments on experimental work on these two diseases are taken from results secured by Dr. T. F. Manns. The experimental orchard was set out April 28, 1915, and contained 225 trees; 90 trees were Belle of Georgia and 105 Elberta. The remainder were miscellaneous varieties. Inoculations were started when the trees were three years old. The inoculum consisted of infusions of fruit, leaves, and limbs of trees affected by yellows or little peach, and inoculations were made through mechanical injuries such as borings, scratching or scarifying of limbs and trunks, and pruning wounds. A total of 76 trees of both varieties were inoculated with yellows material and 55 trees with little peach. (Diagram 1)

Field notes taken this season (1923) indicate no evidence whatever that the actual cases of yellows and little peach observed resulted

Diagram (2) showing actual cases of yellows (Y) and little peach (LP) found in experimental orchard in the summer of 1923. (X - missing trees) (see Delaware quotation).

Row	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1				LP	LP		LP								X
2			LP	LP							X		LP		X
3		LP	LP			LP	X	LP	X	X					X
4		LP		LP				LP	X	LP	X	X	LP	LP	X
5	X	X	X	LP	LP			LP			X		Y	X	X
6				LP	LP							X	LP	LP	X
7								Y							LP
8			LP				LP			Y				X	LP
9								LP		LP	X		LP	LP	LP
10		Y		LP				LP	LP			X	LP	LP	X
11		LP	Y	Y	Y	LP	LP	LP	Y	Y		LP		LP	LP
12		LP	LP	Y	Y	X			Y			LP	LP	X	
13		LP	LP	LP		X	LP		LP		LP	LP	LP		
14					LP	Y	LP		X		X	LP	LP	X	X
15		LP	LP	X	X	LP	X		X			X	X	X	X

from these inoculations. The diagram (2) on present infection indicates a heavy outbreak of little peach this season which is difficult to explain because there had been practically no little peach in this orchard before. (J. F. Adams).

Rosette (cause undetermined)

Rosette was reported from Alabama. According to Miles, one very neglected orchard in Lowndes County showed 80 percent infection. Otherwise the damage appeared to be small.

McClintock (1) reports that he has been able to transmit the disease by means of infected buds from peach to peach, to two varieties of apricot, two of cultivated plum; one wild plum, one cherry, and two varieties of almond. On some of these hosts the disease produced a leaf mottling similar to mosaic.

Literature cited:

1. McClintock, J. A. Peach rosette, an infectious mosaic. Jour. Agr. Res. 24: 307-316. 1923.

Root knot caused by Heterodera radicicola (Greef) Müll.

Root knot was reported from South Carolina, Georgia, Alabama, Mississippi, Texas, and California. Neal and Barker stated that it was the most serious disease of peach trees in Mississippi, and the limiting factor in peach production in the southern part of the state. The loss was estimated at 5 percent. In Alabama, according to Miles, "No nursery in the state is free from this trouble. It is difficult to estimate the damage done in bearing orchards," A loss of 3 percent was reported from California, and 1 percent from Texas. (See also Pl. Dis. Reporter 7: 67. Sept. 1, 1923)

In California, according to Milbrath, peach trees affected were on peach roots, while apricot root stock has been resistant. McClintock (1, 2) has reported that resistance to the root knot nematode is apparently hereditary in the peach, and believes that by the use of resistant seedlings as root stocks, the root knot problem may eventually be solved for this host.

Neal and Barker reported that "Inoculated sulfur treatment followed by lime gave promising results but no definite conclusions can be drawn until further tests can be made."

Literature cited:

1. McClintock, J. A. The transmission of nematode resistance in the peach. Science n. s. 58: 466-467. Dec. 7, 1923.
2. ---------- Seed transmission of root-knot nematode resistance in the peach. (Abstract). Phytopath. 14: 62. Jan. 1924.

Other diseases and injuries

Powdery mildew caused by Sphaerotheca pannosa (Fr.) Lév. was reported fro Pennsylvania, Kentucky, and Texas, and from Illinois for the first time. (Pl.

Dis. Reporter 7: 18. July 1, 1923.)

Bud rot of peach, caused by Fusarium gemmiperda Aderhold, has recently been reported from Georgia by Roberts (5).

Root rot caused by Ozonium omnivorum Shear was reported from Texas, and Arizona. It is one of the important peach diseases in the latter state, almost invariably killing trees attacked, according to Brown. It is said to be most conspicuous during the dry months preceding the summer rains.

Other parasitic diseases reported were shot hole caused by Cercospora circumscissa Sacc. from Mississippi, Florida, and Texas; leafspot caused by Phyllosticta circumscissa Cke., New Jersey; frosty mildew caused by Cercosporella persicae Sacc., Florida; black rot caused by Physalospora cydoniae Arnaud, Delaware (on Elberta peaches on the tree; first observation of this rot on peach in Delaware); stem blight caused by Phoma persicae Sacc., Ohio; die-back caused by Valsa leucostoma (Pers.) Fr., New York, Illinois; root rot caused by Armillaria mellea (Fr.) Quelet, Mississippi; fruit rots caused by Fusarium sp., and Alternaria sp. from California, and by Aspergillus niger Van Tieghem from Texas and California; silver leaf caused by Stereum purpureum Fr. from New York.

Troubles of non-parasitic or undetermined cause reported were gummosis from Florida, Ohio, and Washington; chlorosis due to excess of lime from Texas; sunscald of fruit, Indiana (probably due to defoliation by Bacterium pruni and subsequent exposure of fruit to the sun), Michigan; sunburn, Illinois; winter injury from Connecticut, South Carolina, Mississippi, Ohio, and Iowa; frost injury from Connecticut, and Delaware; little leaf from California.

Spray injury was reported from Connecticut, New Jersey, Delaware, Maryland, and Ohio.

Connecticut: Several reports of severe injury to peach foliage where lead arsenate was used in spray. (Clinton)

New Jersey: A number of orchards have been observed in which there is considerable spray injury. In one orchard in Cumberland County the trees were almost defoliated following the use of atomic sulfur. The injury was less severe in orchards sprayed with self-boiled lime sulfur and dry-mix but was present. At New Brunswick considerable injury was present on trees sprayed with dry-mix. The leaves were burned and large cankers were observed on both the new and old wood. (Dept. Pl. Path.)

Delaware: Considerable defoliation due to spray injury occurred during the middle of August. The injury was in the form of marginal burning as well as large shot -hole areas. In most instances, the growers confused the disturbance with the bacterial shot-hole. It was common in sprayed and dusted orchards. The older leaves rather than the later developed leaves were affected and the leaves injured formed a definite zone of about 6 to 8 leaves on the new seasons growth. The injury occurred during the first week of August when several showers followed by high temperatures occurred. (J. F. Adams)

General references:

1. Barss, H. P. Peach tree protection a duty. Bienn. Rept. Bd. Hort. Oregon 17: 159-161. 1923. (Control of Coryneum blight and leaf-curl.)

2. Cayley, D. M. Fungi associated with "Die back" in stone fruit trees. I. Ann. Appl. Biol. 10: 253-274. 1923.
3. Gourley, J. H. Peach growing in Ohio. Mo. Bul. Ohio Agr. Exp. Sta. 8: 35-42. 1923.
4. Headlee, Thomas J., William H. Martin, and Arthur J. Farley. Spray calendar for peaches. New Jersey Agr. Exp. Sta. Cir. 148. 4 pp. 1923.
5. Roberts, J. W. A budrot of peach caused by a species of Fusarium. Jour. Agr. Res. 26: 507-511. Dec. 8, 1923.
6. Stearns, L. A., and W. S. Hough. Spreader tests on apples and peaches. Jour. Econ. Entomol. 16: 198-207. 1923. (Abstract in Bot. Absts. 12: entry 6596. Nov. 1923)
7. Young, H. C. Colloidal sulfur as a spray material. (Abstract) Phytopath. 14: 61-62. Jan. 1924.
8. Zappe, M. P., and E. M. Stoddard. Results of dusting versus spraying in Connecticut apple and peach orchards in 1922. Connecticut Agr. Exp. Sta. Bul. 245: 229-243. Feb. 1923.

NECTARINE

Scab caused by *Cladosporium carpophilum* Thüm. was reported from New York and Illinois.

Brown rot caused by *Sclerotinia cinerea* (Bon.) Schröt. - New York.

Pink rot caused by *Cephalothecium* sp. - Illinois, "Two trees near Marion, Williamson County, had 40% of the fruit affected." (Tehon and Anderson)

PLUM AND PRUNE

Brown rot caused by *Sclerotinia cinerea* (Bon.) Schröt.

Brown rot was reported to be generally prevalent throughout the east from Massachusetts to South Carolina and as far west as North Dakota, Iowa, Missouri, and Arkansas. While it is always an important disease it was apparently less prevalent than usual throughout the northern United States except in Maryland. From Ohio and West Virginia westward it was of greater importance than usual, although in West Virginia the reduction in curculio injury was correlated with a reduction in the losses as compared with 1922.

In general the disease appeared as the usual fruit rot accompanying the late seasonal rains, but in New York and Minnesota blossom and twig blight were reported as being prevalent, and in Ohio and Illinois twig blight was severe locally.

The losses reported in 1923 are as follows:

PLUM AND PRUNE - Brown rot

State	Percent	State	Percent
New York	2	Illinois	5
Delaware	0.5	Wisconsin	21
Maryland	7	Minnesota	3.5
West Virginia	4	Iowa	22
South Carolina	1	North Dakota	1
Arkansas	10 to 20		

Dates of first appearance:

May 16	(blossoms)	Ramsey Co., Minn.	July 9	(fruit)	Clemson Col., S. C.
" 18	(blossoms)	Madison, Wis.	" 16	(fruit)	Greenville, Ill.
June 8	(fruit)	Tompkins, N. Y.	Aug. 27	(fruit)	Cass Co., N. D.
" 20	(fruit)	Newark, Del.	Sept. 29	(fruit)	Wethersfield, Conn.

Ascospore discharge was observed May 8 in Minnesota.

Black knot caused by Plowrightia morbosa (Schw.) Sacc.

Black knot was reported from the usual localities east of the Rocky Mountains. In only one state, Ohio, was it reported to be of greater prevalence than in 1922. In general it was of little importance except in neglected orchards or on a few trees about the garden. From Michigan there was one report on Burbank plum and in that state it is said to be of general occurrence on americana plums in the Upper Peninsula.

Plum pockets caused by Exoascus pruni (Berk.) Fuckel and E. communis Sad.

Plum pockets was reported from two counties in New York where it caused considerable loss in unsprayed home orchards. Two reports were received from Kentucky. In the vicinity of Gainesville, Florida, all wild plum trees inspected were 100 percent affected, no fruit maturing unattacked. A loss of 1 percent was estimated in Texas. The disease was reported as occurring in Ohio and Indiana. It was common on native and hybrid plums in Wisconsin where limb galls were observed. Fairly heavy local infections occurred in southern Minnesota. Prunus americana was especially susceptible in regions where rains occurred about two weeks after flowering time. A loss of 0.5 percent was estimated in Minnesota. The usual prevalence of the disease in Iowa and North Dakota was reported. A loss of 5 percent was reported in North Dakota. In Colorado the disease occurred as usual on wild species of Prunus, causing deformation and enlargement of leaves and shoots chiefly. The rainfall and temperature were above normal during the period of infection. One case of the disease on plums was reported from New Mexico.

Dates of earliest appearance:

June 3 Hennepin County, Minnesota
June 15 Onondaga County, New York
July 10 Barron, Wisconsin
July 12 Cass County, North Dakota

Leaf curl caused by *Exoascus mirabilis* Atk.

Leaf curl was reported as being the most important disease of red plums in Illinois; 30 percent of the plantings in that state are estimated to be infected, producing bud, leaf and twig injury. This disease has previously been reported as caused by *Exoascus pruni*. (Tehon & Anderson) The same disease was reported at Leesville, Louisiana, by Edgerton.

Leaf spot caused by *Coccomyces prunophorae* Higgins

Leaf spot was reported from New York, Pennsylvania, Florida, Ohio, Indiana, Illinois, Michigan, Wisconsin, and Minnesota (with *Phyllosticta prunicola* Sacc.). Indiana and Illinois were the only states reporting more of the disease than usual.

Florida: Very destructive to both wild and cultivated plums in the vicinity of Gainesville. The leaves were severely shot-holed and 40 percent were shed. (Weber)
Indiana: On Burbank plum in one case. In another noted only on native plum and none on adjacent Japanese plums. (Gardner)
Illinois: Second to brown rot in crop reduction. Loss 1 percent. Throughout state, but more severe southward. (Tehon & Anderson)
Wisconsin: Of very minor importance, as usual. Other similar leaf spotting seems to be due to spray injury (too strong lime-sulfur); apparently resembles bacterial spot but unable to prove organism. (Vaughn)
(See also Pl. Dis. Reporter 7: 97. Oct. 1, 1923)

Scab caused by *Cladosporium carpophilum* Thüm.

Scab on plum was reported from Ohio, Wisconsin, and Minnesota. Dr. J. W. Roberts, of the Office of Fruit Disease Investigations, makes the following statement concerning the occurrence of this disease on plum:

> "Scab on plum is not rare yet it is not very common. It appears to be found more often in the Middle West than further east. It is commonly believed that the same species of Cladosporium affects all the stone fruits, although I believe that final evidence is lacking as to the truth of this."

Other diseases and injuries

Bacterial leafspot caused by *Bacterium pruni* EFS. was reported from Massachusetts, New York, South Carolina, Florida, Texas, Oklahoma and Ohio.
Rust caused by *Tranzschelia punctata* (Pers.) Arth. (Puccinia pruni-spinosae Pers.) - Mississippi, "Heavy infection in Oktibbeha County; too late to cause much damage." (Neal and Barker);

Texas; Oklahoma, Kansas, - "apparently worse than usual (Stokdyk); California, "In all prune districts; loss about .2 percent." (Milbrath)

Powdery mildew caused by Podosphaera oxyacanthae (DC.) DeBary - Florida, "Common and destructive although not widespread. The new growth was particularly attacked." (Weber)

Phyllosticta prunicola Sacc., reported from Minnesota; Septobasidium sp. from Louisiana; S. pseudopedicillatum from South Carolina; S. pedicillatum (Schw.) Pat. and S. retiforme (B. & C.) Pat. from Florida; Valsa leucostoma (Pers.) Fr. from Texas; twig blight caused by Diplodia pruni Fckl., Florida; wood decay caused by Armillaria mellea (Fr.) Quelet from California by Milbrath, who says, "About 1 percent of the trees in the state are severely affected."; Heterodera radicicola (Greef) Müll. and Bacterium tumefaciens EFS. & Towns. from Arizona, "Both nemas and crown gall on same specimen." (Brown)

Rosette was transmitted by McClintock (see peach) from peach to two varieties of cultivated plums, Blue Damson and Red June, and to the wild Chickasaw plum, and also from the wild Chickasaw plum to Red June, by means of infected buds. The Marianna plum was found to be immune.

Yellows (cause not determined) - Delaware, observed in Sussex County on several trees of the Japanese varieties. (Adams)

Sour sap (cause unknown) - California, very general throughout the state; loss about 5 percent. (Milbrath)

Premature dropping of the fruit, due to dry weather, was reported from New York; drought spot from Delaware; drought injury from Washington.

Spray injury - Wisconsin (see report under Coccomyces prunophorae).

Literature:

Dorsey, M. J., and P. D. Strausbaugh. Plum investigations. I. Winter injury to plum during dormancy. Bot. Gaz. 76: 113-143. Oct. 1923.

Headlee, Thomas J., William H. Martin, and Arthur J. Farley. Spray calendar for plums and cherries. New Jersey Agr. Exp. Sta. Cir. 150. 4 pp. 1923.

Roberts, J. W. Plum blotch. Phytopath. 13: 461-462. Oct. 1923.

Roberts, R. H. Effect of defoliation upon blossom bud formation. Wisconsin Agr. Exp. Sta. Res. Bul. 56. 15 pp. Jan. 1923.

CHERRY

Leaf spot caused by Coccomyces hiemalis Higgins

Leaf spot was in general much less severe and less widely distributed than usual. Kentucky, Indiana, Illinois, and Arkansas were the only states where the disease was reported as being more severe than usual and where defoliation was prevalent, although in Iowa a 4 percent loss was reported. In Indiana, Gardner reports that leaf spot was the worst disease of cherries in 1923. The disease was not reported west of Iowa.

CHERRY - Leaf spot

Losses reported in 1923:

New York	.5	Illinois	1.5
Pennsylvania	.3	Iowa	4
Delaware	.2	Arkansas	4

Dates of earliest appearance:

May 14 Tompkins Co., N. Y.
June 10 Sturgeon Bay, Wis.
June 13 Flora, Clay Co., Ill.
June 16 East Lansing, Mich.
June 18 Floyd Co., Ind.
July 31 Seaford, Del.

Control:

Wisconsin: Spray and dust treatments satisfactory, though there was not enough disease to make a good comparison. (Vaughan)

The experiments of Keitt and Jones have shown that the addition of adhesives to fungicides failed to increase their efficiency for the control of cherry leaf spot. The best control was secured from 3 applications of a 3-3-50 Bordeaux mixture, the first spraying being made just after the petals had fallen, the second two weeks later, and the third after harvesting of the fruit.

Literature:

Keitt, G. W., and L. K. Jones. Seasonal development and control of apple scab and cherry leaf spot in relation to environment. (Abstract) Phytopath. 14: 36. Jan. 1924.

Brown rot caused by Sclerotinia cinerea (Bon.) Schröt.

Cherry brown rot was reported over a wider area than plum brown rot in 1923. In general it appears to have had about the same geographical distribution as in 1922, but was certainly less destructive in the northeastern United States. Throughout the cherry areas of the northern and central belt and in the south it was fully as severe as in 1922 and in some regions, notably Illinois and Iowa, it was more destructive.

The losses reported were as follows:

State	Percent	State	Percent
New York	2	Iowa	3
Delaware	0.5	Arkansas	3 - 4
Indiana	1	New Mexico	2
Illinois	2		

Blossom blight was reported from New York and Indiana; twig blight from New York, New Jersey, and Missouri. In Missouri the sand cherry (Prunus *besseyi*) showed severe twig blighting in the nursery followed by fruit rot at Mountain Grove. (Rhodes) Both sweet and sour cherries were reported susceptible in New York but in general the disease was more severe on the sweet cherries. Canker in sweet cherries was severe in one locality in New York. (Newhall)

Dates of first appearance:

June 1 Mountain Grove, Mo.
June 11 Wayne Co., N. Y.
June 14 Mt. Vernon, Ill.
June 20 Whitley Co., Ind.
June 21 New Haven, Conn.
July 13 Summit Co., Ohio

Literature:

Ludwigs, Karl. Bericht über das Auftreten der Spitzendurre (Monilia) bei Kirschen in der Provinz Brandenburg im Jahre 1922. (Report on the occurrence of withertip (Monilia) of cherries in the province of Brandenburg in 1922.) Deut. Obstb. Zeit. 69: 91-92. Mar. 1923.

Other diseases and injuries

Bacterial spot caused by *Bacterium pruni* EFS. - reported from New York as rather common on both sweet and sour cherry, severe locally and often confused with spray or dust injury; and from Mississippi. (See also Plant Dis. Reporter 7: 12. June 15, 1923.)

Powdery mildew caused by *Podosphaera oxyacanthae* (Fr.) DeBary - New York, Ohio, Indiana, Illinois, Iowa, Missouri, Colorado.

Black knot caused by *Plowrightia morbosa* (Schw.) Sacc. - Connecticut, "On choke cherry; scattered over state." (Clinton); New York, "Not important; general but more severe locally and on certain varieties. Observed on *P. serotina* in Nassau and Onondaga Counties. Very common on the native wild cherry in Suffolk County. Some reports on sweet and sour cherry." (Guba); Idaho, "Unimportant on cultivated forms; found on wild species in all parts of the state." (Hungerford)

Other parasitic diseases reported were fruit rot caused by *Botrytis* sp., New York (on Morello); scab caused by *Cladosporium carpophilum* Thüm., New York (on English Morello), Iowa; blight caused by *Coryneum beijerinckii* Oud., Washington; leafspot caused by *Cercospora cerasella* Sacc. (2) from Florida; rust caused by *Tranzschelia punctata* (Pers.) Arth., Mississippi; bacterial gummosis caused by *Bacterium cerasi* Griffin, Oregon (1), California (found in all cherry districts; loss about .5 percent - Milbrath); crown gall caused by *Bacterium tumefaciens* EFS. & Towns., Washington; canker caused by *Phomopsis padina* (Sacc.) Died. First report to Survey in United States; found at Red Creek, New York, July 28; (common on trees with winter killed twigs - Guba); leaf blotch caused by *Pestalozzia longiseta* Speg., Florida.

Rosette was transmitted by McClintock (see peach) from peach to Mazzard cherries.

Frost injury was reported from Iowa, where Melhus estimated a 4 percent reduction in yield due to this cause, and from Washington, as follows:

> "Considerable shot-holing of leaves with general mutilation of the foliage has occurred in eastern Washington sections,

due to late spring frosts or low temperatures during the winter." (Dana)

Winter injury - Connecticut, Ohio, Washington.

Miscellaneous references:

Cited

1. Barss, H. P. Bacterial gummosis of the cherry. Bienn. Rept. 17: 152-154. 1923.
2. Miyake, Chuichi. On a brown shot hole disease of cherry leaves caused by Mycosphaerella cerasella Aderh. Ann. Phytopath. Soc. Japan 1: 31-42. 1923.
   In Japanese; English summary pp. 41-42.
   Common on Prunus cerasus, also on P. yamasakura typica, P. yamasakura spontanea subvar. hortensis, P. rosakura, and P. itosakura subhirtella. Ascigerous stage of Cercospora cerasella Sacc. (Abstracted in Rev. Appl. Myc. 2: 416. Sept. 1923)

Not cited

Young, H. C. Colloidal sulfur as a spray material. (Abstract) Phytopath. 14: 61-62. Jan. 1924.

APRICOT

Blight caused by Coryneum beijerinckii Oud.

Coryneum blight was reported from Idaho, where it was said to be the most important disease of apricots, Washington, and California. Milbrath made the following statement regarding its occurrence in California:

> "Shot-hole (Coryneum beijerinckii) was very severe throughout the state. There was hardly an orchard in which the fruit was not affected, ranging from 5 to 100 percent severely infected."

Root knot caused by Heterodera radicicola (Greef) Müll.

Arizona: Six trees killed on a farm six miles northwest of Tucson. Disease common perhaps, in other parts of southern Arizona. (J. G. Brown)

Practically all of the apricot trees in the Salt River Valley are budded on peach roots. Nurseries furnishing stock for our state have used peach roots almost exclusively.

I know of no case of nematodes attacking apricots on their own roots. Some of the more recent plantings in our section have been on apricot roots and I have failed to find any nematode injury. However, the majority of these plantings have been made where nematode infestation was very light.

This may partially account for the resistance. (D. C. George)
California: Apricot root stock (for peaches) has been found to be resistant. (Milbrath)

Other diseases

Black heart disease, caused apparently by a new species of Verticillium, was described by Czarnecki. (Czarnecki, Helen. Studies on the so-called black heart disease of the apricot. Phytopath. 13: 216-224. May 1923.) The disease was observed in several counties in California on apricot and almond in 1916.

Rosette was transmitted by McClintock (see Peach) from peach to apricot seedlings of the Royal and Moorpark varieties, and back to peach by means of infected buds. On apricot the leaves developed symptoms resembling those of mosaic.

Shot hole caused by *Cylindrosporium padi* Karst., Texas; shot hole caused by *Bacterium pruni* EFS., Illinois; scab caused by *Cladosporium carpophilum* Thüm., Texas, New Mexico; brown rot caused by *Sclerotinia cinerea* (Bon.) Schröt., New York, Illinois (twig blight severe locally), California (loss 5 percent); black knot caused by *Plowrightia morbosa* (Schw.) Sacc., New York (one gall on a tree which intermingled with heavily infected plum trees); bacterial gummosis caused by *Bacterium cerasi* Griffin, California (general, loss 0.5 percent).

DISEASES OF SMALL FRUITS

GRAPE

Black rot caused by *Guignardia bidwellii* (Ellis) V. & R.

Black rot, which is generally the most serious disease of American varieties of grapes in the United States, was of very much less than the usual importance in the Northeast but of more than usual destructiveness in the grape areas of the Central and Southern states, except in Arkansas. As with most of our important plant diseases this variation in prevalence and destructiveness was correlated with weather conditions. In the Northeast the relatively dry summer was unfavorable for the disease but in the other areas where the rainfall was greater the disease was of much greater severity.

Estimated losses as compared with 1922:

GRAPE - Black rot

State	1922	1923	State	1922	1923
New Hampshire	trace	trace	Mississippi	5	5
Connecticut	20	much less	Texas	8	10
New York	2	trace	Arkansas	8	2 - 3
Pennsylvania	5	trace	Ohio	5	more
Delaware	5	4	Indiana	2	more
Maryland	10	10	Illinois	3	3.5
West Virginia	20	10	Wisconsin	5	much less
South Carolina	12.5	75	Iowa	5	4

Dates of earliest appearance in 1923:

May 22 (leaf)	Dover, Del.	June 26 (fruit)	Dover, Del.
June 4 -----	Jackson, Co. Ill.	July 9 -------	Clemson College, S.C.
June 9 -----	Oktibbeha Co, Miss.	July 15 -------	Lancaster, Wis.
June 18 -----	Floyd Co., Ind.	Sept.13 -------	Jaffrey, N. H.

Susceptibility of Vitis spp. to black rot from survey in park at Rochester, New York, 1923.

Light infection	Moderate infection	No infection noted
Vitis amurensis	Vitis rotundifolia	Vitis arizonica
V. cinerea	V. vulpina	V. betulifolia
V. coignetiae		V. bicolor
V. doaniana		V. candicans
V. piasezkii		V. champini
V. rupestris		V. labrusca
V. slavinii		V. longi
V. treleasei		V. monticola
		V. romanetti

Of the cultivated grapes observed Niagara and Catawba were most susceptible in Mississippi (Neal & Barker).

Control:

Delaware: The early application of copper fungicides have proved to be of the greatest importance in checking this disease. (Adams)

South Carolina: On vines sprayed with an 8-8-100 Bordeaux, using a casein spreader, a 90 percent control was obtained. On account of the rainy weather early in the season, it was difficult to get into the vineyards and there was severe loss from black rot even where efforts were made to control by spraying. (Moore)

Alabama: Controlled by sprays in most instances where tried. (Miles)

Florida: Bordeaux mixture superior to copper lime dusts. (Weber)

Downy mildew caused by Plasmopara viticola (B. & C.) Berl. & DeToni

Downy mildew was of less importance in the northeast as indicated by reports from Connecticut, New York, and Pennsylvania. In Delaware the disease was of greater prevalence than usual but only of slight importance in September. There was much less mildew in South Carolina than usual where it was confined to the western and central sections, and apparently the disease was of slight importance in Florida, Alabama, Mississippi, Texas, Oklahoma, and Arkansas, although in Mississippi a severe epiphytotic occurred in Oktibbeha County, where several varieties were attacked. In Ohio and Wisconsin this disease was less prevalent than usual but in Indiana, Illinois, and Iowa it was of more than usual importance. The usual prevalence was reported from Minnesota. In Missouri the disease was not serious but was prevalent in the southwest part of the state.

Losses from downy mildew reported in 1923:

State	Percent	State	Percent
New York	trace	Alabama	trace
Pennsylvania	trace	Illinois	2
Maryland	4	Minnesota	trace
South Carolina	1	Iowa	2

Dates of earliest observance:

June 10 Cayuga Co., N. Y.	Aug. 1 Pulaski Co., Ind.
June 22 Columbia, S. C.	Aug. 15 Oktibbeha Co., Miss.
July 1 Hennepin Co., Minn.	Sept. 1 Madison, Wis.
July 6 Tazewell Co., Ill.	Sept. 29 New Castle, Del.
July 14 Westville, Conn.	Oct. 19 Oklahoma
July 28 Delaware, Ohio	

New York: Only traces of the disease are present in commercial plantings. Prevalent on wild grapes upon which severe injury has been noted. Reported from thirty counties on wild grapes. (Guba)

Florida: Weber reports considerable difference in varieties as to their susceptibility to downy mildew in the Experiment Station vineyard.

Weber in Florida reports that Bordeaux is superior to copper-lime dusts in the control of downy mildew.

Powdery mildew caused by Uncinula necator (Schw.) Burr.

Powdery mildew of grape was reported from a number of states scattered through the country, but apparently was not important except in Utah, and California. The reports from these two states are quoted:

Utah: This disease was very severe throughout Davis County. In some vineyards total loss resulted. (Richards)

California: Mildew was extremely severe in 1923. There was not a vineyard which did not have an infection. The percentage loss ranged from 5 to 100 percent. There is a general opinion that the total loss was 45 percent, which would amount to about $25,000,000. One county reported an outlay of $70,000 for sulfur to combat this disease. (Milbrath. See also Pl. Dis. Reporter 7: 107-108. Nov. 1, 1923)

Recent literature:

Castella, F. de, and C. C. Brittlebank. Oidium of the vine. Jour. Dept. Agr. Victoria 21: 673-685, 738-745. Nov. & Dec. 1923.

Other diseases and injuries

Anthracnose caused by Sphaceloma ampelinum DeBy. was reported from Massachusetts, Maryland, South Carolina, Florida, Alabama, Mississippi, and Illinois. Losses were estimated at 3 percent in South Carolina, 2 percent in Florida and Mississippi, and a trace in Maryland and Alabama.

Rust caused by Physopella vitis (Thum.) Arth. - Florida, California (according to Milbrath the disease was found in Santa Cruz County. This is the first time this rust has been reported from California). This rust was severe in Florida on several varieties of grapes developed by Munson.

Root knot caused by Heterodera radicicola (Greef) Mull. - California (2) (scattered throughout state; loss about 2 percent - Milbrath.)

Glomerella cingulata (Stonem.) S. & von S., New York, Illinois, Missouri; Melanconium fuligineum (Scrib. & Viala) Cav., Delaware, Missouri; Isariopsis clavispora (B. & C.) Sacc. (Cercospora viticola (Ces.) Sacc.), South Carolina, Florida; Cryptosporella viticola (Red.) Shear, New York, Ohio, Kansas; Bacterium tumefaciens EFS. & Towns., Ohio, New Mexico; Pestalozzia menezesiana Torrend and P. uvicola Speg. from Florida; Ozonium omnivorum Shear, Texas.

A mosaic-like trouble was reported by Weber as having been found on a single variety near Gainesville, Florida.

Black measles (cause unknown) - California (1) (severe throughout the state. The loss in certain vineyards ranged from 2 to 100 percent. The total loss in the state is about 3 percent. - Milbrath).

Chlorosis - Texas (due to excess of lime); Illinois (a type of chlorosis which seems to be almost epidemic in character is appearing in the region of Collinsville - Anderson, June 29).

Drought injury - leaf scorch, New York; tip burn, Idaho; leaf fall, Missouri; shrivelling of fruit, Missouri, Arizona.

Winter injury - Connecticut, Minnesota, Washington.

Recent literature:

Cited:

1. Bioletti, F. T. Black measles, water berries, and related vine troubles. California Agr. Exp. Sta. Bul. 358: 509-524. Apr. 1923.

2. Nougaret, R. L. Rootknot on grape. Monthly Bul. California Dept. Agr. 12: 139-146. Mar. - Aprl. 1923.

Not cited:

Faes, Henry, and M. Staehelin. Nouvelle contribution à l'étude du coitre de la vigne (Coniothyrium diplodiella) ou maladie de la grêle. Ann. Agr. Suisse 24: 19-28. 1923.

Gard, Médéric, L'apoplexie de la vigne. Les Moyens de la combattre et d'y remédier. Rev. Vitic. 58: 399-401. May 31, 1923.

Headlee, Thomas J., William H. Martin, and Arthur J. Farley. Spray calendar for grapes. New Jersey Agr. Exp. Sta. Circ. 151. 1923.

Moreau, L. Contribution a l'étude de la maladie de l'esca (Apoplexie de la vigne) et de son traitement. Compt. Rend. Acad. Agr. France 9: 951-953. Dec. 26, 1923.

Moreau, L. and E. Vinet. Contribution a l'étude de l'apoplexie de la vigne et de son traitement. Compt. Rend. Acad. Agr. France 9: 32-36. Jan. 1923. Bul. Agr. Algérie, Tunisie, Maroc III, 29: 5-7. 1923.
Rev. Vitic. 58: 337-339. May 3, 1923.

Petri, L. L'arricciamento della vite è una malattia prodotta da protozoi? (Is the leaf curl of grapes a disease produced by protozoa?) Atti R. Accad. Lincei Roma Rendiconti Cl. Sci. Fis. Mat. e Nat. 32¹: 395-397. 1923.
(Abstract, Bot. Absts. 13: entry 1064. Feb. 1924.

Putterill, V. A. Plant diseases in the Western Cape Province VIII. Court-Noué or short node disease of the vine. Jour. Dept. Agr. South Africa 6: 458-460. May 1923.

Rives, Louis. Le court-noué et les mycorhizes endotrophes de la vigne. Rev. Vitic. 59: 385 - 392. 405-409. Dec. 13, 20, 1923.

Ruban, G. Le permanganate de potasse: agent de traitement de maladies de la vigne. Rev. Vitic. 58: 269-272. 1923.

Young, H. C. Colloidal sulfur as a spray material. (Abstract) Phytopath. 14: 61-62. Jan. 1924.

STRAWBERRY

Leaf spot caused by Mycosphaerella fragariae (Schw.) Lindau

The common leaf spot was prevalent wherever strawberries are grown. Reports indicate that it was of more than average importance in Mississippi, Louisiana, Indiana and Illinois. In Illinois it was the most important disease of the year and was much more abundant than usual.

The following reductions in yield were reported:

State	Percent	State	Percent
New York	1	Mississippi	trace
Delaware	trace	Illinois	12
New Jersey	trace	Minnesota	1
Alabama	1	Iowa	5
Louisiana	1	North Dakota	trace

Earliest dates of observance in 1923:

Jan.	Hammond, La.	May 23	Chisago Co., Minn.
Mar. 25	Oktibbeha Co., Miss.	June 5	Franklin Co., Ill.
May 11	New York City	June 25	Fargo, N. D.
May 16	Lafayette, Ind.	July 10	Dayton, Ohio
May 17	Hartley, Del.	Aug.	Fort Collins, Colo.

New York: McAlpine growing beside Premier was badly affected. Premier variety almost free from infection in New York. (Guba)

Maryland: Our commercial growers are gradually eliminating the more susceptible varieties. (Temple)

Indiana: In one field "Charles the First" showed some resistance. Aroma and Progressive appeared resistant in Jefferson County. (Gardner)

Illinois: Aroma appears less susceptible than Lady Camille. Dunlap in Morgan County were thoroughly infected. (Tehon & Anderson)

Iowa: Rockhill, a new everbearing strawberry is said to be resistant.

Leaf scorch caused by *Mollisia earliana* (Ell. & Ev.) Sacc.

Leaf scorch was reported from North Carolina, Georgia, Louisiana, Indiana, Illinois and Wisconsin. Fant estimates a 10 percent loss as due to this disease in North Carolina. Regarding the control of leaf scorch, he says, "Good control of this disease has been secured within the state during 1922 and 1923 through the use of Bordeaux mixture. Five spray applications were made, the first at the first symptom of infection in the spring, and the last ten days before picking."

Wolf (1) states that leaf scorch is regarded as the most destructive disease of strawberry in North Carolina, and has been collected also in New York, Connecticut, New Jersey, Indiana, West Virginia, Wisconsin, Montana, Maryland, Louisiana, Tennessee, and Florida. The organism affects the leaves petioles, fruit pedicels, and calyx lobes. It does not attack species of Potentilla.

Literature cited:

1. Wolf, Frederick A. Strawberry leaf-scorch. (Abstract). Phytopath 14: 30. Jan. 1924.

Root rot - (cause undetermined)

An undetermined root rot is reported as important in several states. Various factors are mentioned as contributing to the development of the disease, among them winter injury (Connecticut, New York) soil conditions, fungi such as _Fusarium_ sp.(Ohio, Mississippi), and _Rhizoctonia_ sp. (Michigan), but in no case has the trouble been proved to be due to any specific cause. The following quotations indicate the condition:

> _New York:_ Root rot is prevalent in many counties and many specimens are sent to the laboratory by growers. The cause of the trouble has not been determined. Apparently the root rot is brought about by low temperatures or other weakening factors followed by weakly parasitic soil organisms. (Chupp, July 1)
>
> Very important locally; caused a loss of 0.5 percent. (Guba)
>
> _Illinois:_ Of great importance throughout central Illinois; caused a loss estimated at 1 percent. (Tehon & Anderson)
>
> _Michigan:_ Black root (_Rhizoctonia_ sp.?), A number of strawberry plantings have suffered from rotting away of the root system. As high as 40 percent of the plants in some patches killed or stunted so severely that no marketable berries were produced. (C. W. Bennett)
>
> _Idaho:_ Yellowing of plant and rotting of crown; more important this year than usual. Evidently associated with alkaline soil. Common throughout the irrigated district. (Hungerford)

C. D. Sherbakoff (1) has reported a disease of a similar nature in Alabama and Tennessee.

Literature cited:

1. Sherbakoff, C. D. Three little known diseases of strawberries. (Abstract). Phytopath. 14: 60-61. Jan. 1924.

Other diseases and injuries

Leaf blight caused by _Ascochyta fragariae_ Sacc. - Connecticut (not serious except on Glen Mary), New York; leafspot caused by _Dendrophoma obscurans_ (Ell. & Ev.) Anderson, Illinois; leafspot caused by _Phyllosticta fragaricola_ D. & Rab., Florida; powdery mildew caused by _Sphaerotheca humuli_ (Fr.) Burr., New York, Washington; leaf spot caused by _Pestalozzia guepini_ Desm., Florida.

Gray mold rot caused by _Botrytis_ sp. - Connecticut (in one case about 75 percent of crop of Premier lost, Chesapeake little impaired); New York (Premier rotting badly while berries are still green, McAlpine growing in adjacent rows only slightly affected), New Jersey, Mississippi, Ohio, Wisconsin, Minnesota, Arkansas, Idaho, Washington.

Rhizopus rot caused by _Rhizopus_ sp. - New York, Alabama, Iowa.

Rot caused by _Phytophthora_ sp. was reported from Arkansas by D. H. Rose as causing severe damage in some localities.

Rot caused by _Schizoparme straminea_ Shear, n. Gen. et sp., (1)

Rot caused by _Pezizella lythri_ (Desm.) Shear & Dodge - Louisiana.

Lilac soft rot and _brown hardrot_ of berries were reported by Sherbakoff (2) as common and destructive in Tennessee during 1923. _Pythium_ sp. was isolated from berries affected by the softrot and _Rhizoctonia_ sp. from the other decay.

STRAWBERRY - Other diseases

Slime molds assumed some importance in Minnesota (Fuligo sp.) and Kansas (Didymium sp., Diachaea leucopodia (Bull.) R., Physarum vernum)

Wilt caused by Fusarium sp., Florida; Rhizoctonia disease caused by Corticium vagum solani Burt, Washington; rootknot caused by Heterodera radicicola (Greef) Müll., Mississippi.

Yellows, cause unknown - Minnesota, "Common on some varieties such as Dunlap and Minnesota #3. The latter variety is not grown much on account of this trouble." (Sect. Pl. Path.)

Winter injury - Connecticut, Washington (important in all sections of the state, probably increased by contributing factors).

Frost injury - Florida, Louisiana, Texas, Iowa.

Recent literature:

Cited:

1. Shear, C. L. Life histories and undescribed genera and species of fungi. Mycologia 15: 120-131. 1923.
2. Sherbakoff, C. D. Three little known diseases of strawberries. (Abstract). Phytopath. 14: 60-61. Jan. 1924.

Not cited:

Ballard, E., and G. S. Peren. Red plant in strawberries and its correlation with "cauliflower disease." Jour. Pomol. & Hort. Sci. 3: 142-147. Sept. 1923.
Both diseases caused by the nematode Aphelenchus fragariae Ritz. Bos.

Dodge, B. O. Origin of the central and ostiolar cavities in pycnidia of certain fungus parasites of fruits. Jour. Agr. Res. 23: 743-760. Mar. 3, 1923.

Godfrey, G. H. The stem and bulb infesting nematode, Tylenchus dipsaci, in the Pacific Coast states (Washington, D. C.) Sept. 29, 1923.

Goodey, T. A. A review of the plant parasitic members of the genus Aphelenchus. Jour. Helminthol. 1: 143-156. Sept. 1923.
"Red plant" and "cauliflower" diseases of strawberry caused by Aphelenchus fragariae, attacking buds in the case of red plant, and stems in the other disease.

McKay, M. B. A serious nematode disease of strawberry and clover in Oregon. Bienn. Rep. Bd. Hort. Oregon 17: 177-182. 1923. (Also in Oregon Agr. Exp. Sta. Crop Pest and Hort. Rept. 3 (1915-1920); 139-144. Jan. 10, 1921)

RASPBERRY

Anthracnose caused by Plectodiscella veneta (Speg.) Burk.

(Gloeosporium venetum Speg.)

Anthracnose is probably the most serious fungous disease of raspberries especially black caps, in the eastern United States. It undoubtedly is causing greater damage than has been generally suspected.

In 1923 it was reported from Massachusetts to Florida and west to North Dakota and Arkansas. It was not considered to be of especial importance except in the following states: New York, Pennsylvania, New Jersey, West Virginia, Arkansas, Ohio, Indiana, Illinois, Wisconsin, and Iowa.

The following losses were reported in 1923:

State	Percent	State	Percent
New York	2	Michigan	1
Pennsylvania	15	Minnesota	1
Indiana	10	Iowa	8
Illinois	3	North Dakota	1

Dates of earliest observation in 1923:

May 19	Floyd Co., Ind.	June 19	Newark, Delaware
June 18	Ramsey Co., Minn	July 2	Woodland, Ill.
June 19	Oneida Co., N. Y.		

Varietal susceptibility:

New York: Black caps most susceptible; reds and purple varieties like Columbia somewhat less susceptible.

Pennsylvania: Black caps like Cumberland and Plum Farmer and the purple Columbia severely attacked.

Delaware: Cumberland and Gregg susceptible. Stark shows slight infection.

Indiana: Serious only in black caps. Cumberland especially so. In one patch Plum Farmer showed some resistance. (Gardner)

Michigan: All black varieties very subject to this disease. Red varieties not subject to severe injury. (Bennett)

Minnesota: Black caps very susceptible. (Sect. Pl. Path.)

Control:

New Jersey: On a spray plot conducted at Hammonton only 25 percent of the canes were free from anthracnose on the unsprayed plots as compared with 97 percent clean canes on the plots sprayed with lime-sulfur 1-40. (Martin)

Indiana: Delayed dormant lime-sulfur 1-10 when leaf buds were bursting, and Bordeaux mixture 6-10-100 when the new canes were 8-12 inches high gave good control in four localities in 1923. (Gardner)

Wisconsin: Experiments by L. K. Jones for the control of anthracnose of black raspberries showed that two applications of lime-sulfur controlled the disease for commercial purposes. The addition of an adhesive to the mixture seemed to increase the efficiency of the fungicide. In general, Bordeaux mixture was less effective, though two applications gave a satisfactory commercial control. A third application of either Bordeaux mixture or lime-sulfur made a week after blooming of the plants was beneficial in reducing the amount of disease, but severe injury to the foliage followed.

Literature:

Anon. Plant diesease investigations at the Wisconsin Station. Wisconsin Agr. Exp. Sta. Bul. 352; 46, 53-65. 1923.

Orange rust caused by Gymnoconia interstitialis (Schl.) Lagerh.

Reported from Connecticut on wild plants; from New York on wild black raspberry and in Chemung County on cultivated varieties. Not reported on red or purple varieties. Orange rust was common in central and south Jersey. It was slightly prevalent in Pennsylvania, Ohio, Illinois, and Minnesota. In Michigan the disease was very important in certain localities in the southern peninsula on certain varieties but not on red raspberries. A 2 % loss was reported from Michigan. In Arkansas the rust is said to be general over the state and becoming more and more important; the loss in 1923 being estimated at 5-7 percent.

Dodge (1) has recently called attention to the wide distribution of the long-cycle orange rust as follows:

> "The long-cycled Gymnoconia is the only orange-rust known in Europe and Asia. When it was discovered that there were two of these rusts in North America it was said that the short-cycled form was southern in its distribution and the long-cycled strictly northern, the former being the rust so destructive to the blackberries and dewberries grown commercially. It is now known that it is no longer necessary to make pilgrimages to Bartlett, New Hampshire, for the Gymnoconia, because this rust thrives wherever the black raspberry, Rubus occidentalis, or its susceptible horticultural varieties may grow. The writer has reported that the rust is common on blackberries near Washington, D. C., and at Old Fort, North Carolina. He has since found it in abundance on blackberries at Salem, N. C., the type locality of Kunkelia nitens and at Cornelia, Ga. Germination tests reported in a letter to the author by Dr. Dosdall, mycologist at the Minnesota Agricultural Experimental Station, show that the Gymnoconia is probably very common in that state."

RASPBERRY - Orange rust

Regarding infection of raspberries Dodge says:

> "Canes of a thoroughly infected black raspberry do not root at the tips very readily; therefore the long-cycled rust is not so often spread vegetatively to tip plants from an infected parent. The infection of very young tip plants by sporidia from teleutospores largely accounts for the appearance of the rust on new plants. The wild raspberry, Rubus occidentalis, and the horticultural varieties, Plum Farmer and Cumberland, were infected by laying black raspberry leaves bearing teleutospores over rooting tips of stolons and maintaining suitable moisture conditions. Infections of the black raspberry also occurred when the teleutospores were taken from blackberry leaves."

As for the relation of this rust between blackberries and raspberries he makes the following statement:

> "The infection experiments prove: (a) that the short-cycled rust on wild blackberry can infect such cultivated varieties as the Kittatinny, Iceberg, Mercereau, Crandall, Taylor, Flowers, Ancient Briton, etc., (b) that the sporophytic stage of the Gymnoconia will go over from the mountain blackberry, Rubus canadensis, to such varieties as the Ward, Taylor, Mercereau, and Loganberry, and that teleutospores can be obtained on leaves of certain blackberries and dewberries by sowing aecidiospores from the black raspberry, which can in turn be likewise infected by sowing aecidiospores from the blackberry; (c) that the black raspberry can also be systemically infected with sporidia from teleutospores of the long-cycled rust on blackberry,
>
> "We have no reason to suspect that the rust on the wild blackberries is in any way unlike that found on the cultivated blackberries, or that forms of the long-cycled rust on the blackberry and on the black raspberry are at all different biologically, except that certain strains may prove to be more vigorous in their parasitism. Later infection experiments tend to show that the Iceberg blackberry which is very susceptible to attack by the short-cycled rust from the blackberry, is very resistant to the rust from the wild dewberry. This short-cycled dewberry rust may be somewhat different biologically."

In another paper (2) Dodge has called attention to a most interesting phenomena attending the infection of Rubus spp. with Gymnoconia. He finds that the gametophytic mycelium affects its host in such a manner as to cause stomata to be formed on the upper leaf surface where otherwise stomata rarely appear. The sporophytic mycelium does not induce any such change.

Dodge makes the following statement regarding the control of orange rust on raspberry:

> "It has been shown that it is of the greatest importance to begin a planting with rust-free nursery stock. If the black raspberry to be used has been propagated by rooting the tips of

canes one may be reasonably sure of getting some infected plants - that is, if the telial stage of the Gymnoconia is present in the nursery. Whether the tips of canes can be made to root early enough so that no buds or shoots that can be infected are formed before the frosts, are problems which will require further investigation. If nurserymen will destroy all infected canes before aecidiospores are shed, there will be no teleutospores in their propagating fields, and it follows that their tip-plants will not be infected when sent to the grower."

Literature:

1. Dodge, B. O. Systemic infections of Rubus with orange-rusts. Jour. Agr. Res. 25: 209-242. 1923.
2. ------------ Effect of the orange rusts of Rubus on the development and distribution of stomata. Jour. Agr. Res. 25: 495-500. 1923.

Mosaic, (Yellows) cause undetermined

Raspberry yellows was reported as follows in 1923:

About as usual		More than usual	
Massachusetts		Pennsylvania	15%
Connecticut		*Maryland	2%
New York	20%	Delaware	1%
Ohio		Idaho	
Wisconsin			
Michigan	10.%		
Minnesota	2.5%		
North Dakota	trace		

* Mosaic and leaf curl

It was also reported from New Jersey, Illinois, Indiana, Kentucky, Iowa and Washington. As regards its seriousness the following reports are of interest:

New York: Severe on reds and blacks all over state, but especially so in eastern New York and the Hudson Valley. Found in 80 percent of the plantings. (Guba)

New Jersey: Severe in South Jersey. (Martin)

Pennsylvania: The loss from this disease is greater than from all other "degeneration" diseases combined. Survey shows 80 percent of plantings of blacks and reds with an average of 20 percent infection. (Krout)

Ohio: Severe in northern counties. (Young)

Wisconsin: Found in 45 red and 15 black raspberry nurseries. (Vaughan)

Minnesota: Serious in some localities. (Sect. Pl. Path.)

Idaho: Found in practically every patch. (Hungerford)

RASPBERRY - Mosaic

Varietal susceptibility:

Connecticut: Most on Cuthbert; also on Early June and St. Regis. (Clinton)
New York: Early June and Yellow Queen susceptible. (Guba)
New Jersey: Severe in Cuthbert. (Martin)
Delaware: Observed on Cumberland. (Adams)
Indiana: Noted on Cuthbert and occasionally on the black cap variety Scarf. (Gardner)
Michigan: Perfection, Plum Farmer, Gregg, Cumberland, Columbia and many other varieties susceptible. Most damage on black caps. (Bennett)
Wisconsin: Marlboro susceptible. (Vaughan)

Control:

In Pennsylvania fifteen patches were rogued from which it is hoped disease free plants will be available in 1924. (Krout)

Literature:

Dickson, B. T. Raspberry mosaic and curl. Sci. Agr. 3: 308-310. May 1923.
Hockey, J. F. The control of raspberry mosaic. Phytopath. 13: -292. 1923.
Rankin, W. H. Running out of raspberries. New York (Geneva) Agr. Exp. Sta. Circ. 67: 12 pp. 1923.
Wilcox, R. B., and F. F. Smith. Transfer of mosaic disease from red to black raspberries. (Abstract) Phytopath. 14: Jan. 1924.

Leaf curl, cause undetermined

Raspberry leaf curl was reported from New York, Pennsylvania, Maryland, Indiana, Michigan, Wisconsin and Minnesota. In New York it occurred locally. In Tompkins County 10 percent of the wild raspberries were affected, but it was generally of slight economic importance.

In Pennsylvania it was found in 80% of the plantings examined by Krout and in 4 nurseries out of 32 by Trimble. About 4% loss was reported by Krout and 1% in nurseries by Trimble. Cuthbert was the most commonly infected variety.

In Indiana it was found on Cumberland and Scarf varieties by Wilcox at Crawfordsville; also on wild black raspberries near by. In Michigan, Cuthbert and Victory were very susceptible, and Gregg and Plum Farmer less so. Marlboro was especially susceptible in Wisconsin where leaf curl was noted in 46 nurseries inspected.

Literature:

Dickson, B. T. Raspberry mosaic and leaf curl. Sci. Agr. 3: 308-310. May 1923.
Rankin, W. H. Running out of raspberries. New York (Geneva) Agr. Exp. Sta. Circ. 67: 1-12. 1923.

Streak (eastern blue stem, rosette) cause undetermined

Streak was reported from New York, Pennsylvania, Maryland, Ohio, Indiana, Illinois, Michigan, and Wisconsin as follows:

New York: Reported from Monroe County on black caps. (Guba)

Pennsylvania: Found in 4 out of 32 nurseries growing raspberries. One of these had about 20 percent and the others less than 1 percent infected plants. (McCubbin)

Found on black caps, Cumberland and Plum Farmer; not on purples or reds. Twelve patches have been rogued. Loss estimated at 1 percent. (Krout)

Maryland: More, loss a trace. (Jehle and Temple)

Ohio: One report from West Toledo. (Young)

Indiana: Found in one patch of Cumberland near Crawfordsville by Wilcox. (Gardner)

Illinois: An important disease, possibly second in importance to anthracnose. Infection ranged from 5 to 90% in different fields in central Illinois. (Tehon & Anderson)

Michigan: Gregg, Plum Farmer and Cumberland chief varieties affected. Of considerable importance in some fields. Loss estimated at 0.5%. (Bennett)

Wisconsin: Of minor importance. (Vaughan)

Literature:

Rankin, W. H. Running out of raspberries. New York (Geneva) Agr. Exp. Sta. Cir. 67: 1-12. 1923.

Zeller, S. M. Mosaic and other systemic diseases of brambles in Oregon. Oregon Agr. Exp. Sta. Cir. 49: 1-15. July 1923.

Other diseases and injuries

Crown gall caused by *Bacterium tumefaciens* EFS. & Towns. - said to be rather important in a number of states. Losses reported were 6% in Iowa, 5% in Michigan, 3% in Pennsylvania, 1.5% in Minnesota, 1% in West Virginia, Illinois, and New Mexico. In Minnesota the disease was said to be the most serious disease of the raspberry. Practically every field of raspberries is infected and in some cases the fields have to be abandoned as far as raspberry growing is concerned.

Leafspot caused by *Mycosphaerella rubi* (West.) Roark (*Septoria rubi* West.) - New York, Pennsylvania, Delaware, Oklahoma, Indiana, Illinois, (rather more than usual, loss 1%), Minnesota, Iowa (2% loss), Missouri.

Spur blight caused by *Mycosphaerella rubina* (Pk.) Jacq. - New York (frequent and destructive locally, loss 1%), Wisconsin, Minnesota (of considerable importance, loss 1.5%. Plants attacked by gray bark seem to be weakened to such an extent that they are easily winter killed), North Dakota (important, 1% loss).

Cane blight caused by *Leptosphaeria coniothyrium* (Fckl.) Sacc. was reported from Massachusetts to West Virginia, and North Dakota to Illinois, and from Idaho; generally not important except locally. In West Virginia, however, it was said to be the most important disease of raspberries. Losses reported were 2% in Pennsylvania and West Virginia, 1% in New York, .5% in Illinois, and a trace in North Dakota.

Powdery mildew caused by Sphaerotheca humuli (DC.) Burr., New York, Minnesota. Rust caused by Phragmidium imitans Arth. - Washington. Western blue stem caused by Acrostolagmus caulophagus Lawrence, New York, (very important locally). Wilt, cause unknown, but probably due to a fungus, Indiana (serious in one patch of Scarf variety, Crawfordsville. R. B. Wilcox saw this August 15 and stated that it resembled western blue stem except that canes died one at a time, instead of all together. (Gardner). Root rot, cause unknown, caused death of affected plants in Indiana and Illinois; winter injury, Iowa (loss 15%), Washington; alkali injury, Washington; fasciation, cause unknown, Maryland (on Cumberland black raspberry; a single plant out of about 40 appeared this year and died as a result).

References:

Bennott, C. W. Disease control in black raspberries. The problem of disease control and increased yields is mainly one of proper cultural methods, sanitation, and selection of disease free stocks. Michigan Agr. Exp. Sta. Quart. Bul. 6: 12-14. August 1923.

Hockey, J. F. Diseases of raspberries. Canad. Hort. 46: 29. Feb. 1923.

------------ Blue stem of black raspberry. Phytopath. 13: 293. 1923.

Leach, Julian G., and J. L. Seal. Powdery mildew of raspberries. (Abstract) Phytopath. 14: 61. Jan. 1924.

Weiss, C. O. Diseases and pests of raspberries. Better Fruit 17^6: 7-8; 17^7: 10, 20. 1923.

Wilcox, R. B. Progress in control of raspberry diseases. Proc. Amer. Pom. Soc. 38: 344-354. 1922.

DEWBERRY

Orange rust caused by Kunkelia nitens (Schw.) Arth. and Gymnoconia interstitialis (Schl.) Lagerh.

The orange rusts of wild dewberry were reported from Connecticut in 1923 as being caused chiefly by the short-cycled species but two reports of Gymnoconia were made as determined by germination tests. (Clinton & McCullock)

The orange rust is commonly found on wild dewberries throughout New York, Delaware, and Pennsylvania.

The Lucretia dewberry is thought by Dodge (1) to be highly resistant if not immune. The southern dewberry, Rubus enslenii, is readily infected by sowing aeciospores of Gymnoconia from black raspberry on its leaves.

Literature:

1. Dodge, B. O. Systemic infections of Rubus with the orange rusts. Jour. Agr. Res. 25: 209-242. 1923.

Other diseases and injuries

Leafspot caused by *Mycosphaerella rubi* Roark (Septoria rubi Westd.), Illinois; *anthracnose* caused by *Gloeosporium* sp., South Carolina; *double blossom* caused by *Fusarium rubi* Wint., Louisiana; *rot* of dewberries grown in North Carolina was reported by Shear (1) as caused by *Phyllostictina carpogena* Shear, n. sp.; *mosaic*, cause unknown, Connecticut (seen on at least one plant of the cultivated dewberries at the Station Experimental Farm. New host to us. - Clinton)

Reference:

1. Shear, C. L. Life histories and undescribed genera and species of fungi. Mycologia 15: 120-131. 1923.

LOGANBERRY

Crown gall caused by *Bacterium tumefaciens* EFS. & Towns., Washington; *winter injury*, Washington.

For orange rust see raspberry.

BLACKBERRY

Orange rust caused by *Kunkelia nitens* (Schw.) Arth. and *Gymnoconia interstitialis* (Schl.) Lagerh.

It is impossible to separate, except in a few cases, the diseases reported as being caused by the two rusts named above. Both the short and the long-cycled forms occur on blackberries over a rather wide area and only by germination of the spores can they be identified specifically by the plant pathologist. The color characters which were reported by Kunkel as being diagnostic are not entirely dependable according to the recent work of Dodge.

It was reported in 1923 from Massachusetts to Florida and westward to Colorado and Oklahoma. This was the second report from Colorado, it being reported from that state in 1904 by Paddock.

It was about as prevalent as usual except in New Jersey, Illinois, and Minnesota where it was reported as being of more than usual importance. In South Carolina it was reported as causing a loss of 20% of the crop. In Illinois a loss of 0.5% and in Iowa a loss of 5% were reported.

In general the disease was most common on wild blackberries throughout the country.

Dodge reports successful attempts to inoculate Iceberg, Crystal White, Kittatinny, Mercereau, Blowers, Ancient Briton, Oregon Evergreen and Crandall with ease. A variety received under the name of "Lawton" from a nursery remained uninfected after two seasons' attempts and is thought to be immune. McDonald also appears to be immune. Snyder and Eldorado appear to be very resistant. (See Dodge for reports on other varieties and species.)

BLACKBERRY - Orange rust

Control:

Dodge (2) makes the following statements:

> "Methods by which the orange-rusts can be eradicated have been suggested in connection with the discussions of the infection experiments. It was pointed out that a blackberry can be freed from the orange-rust very easily if the task is undertaken soon after the primary infection becomes manifest. The mere snapping off of the infected cane at the point of attachment to the root will suffice in many cases. When a number of shoots in the form of a witch's broom are found, it usually indicates that the fungus has invaded the root or its crown; it will then be necessary to destroy this part of the root also. If the primary infection, however, is allowed to spread to the crown and root system the second year, so that new shoots are systemically and secondarily infected, the whole plant must be dug up, care being taken to include the roots for some distance.
>
> "So far as controlling the short-cycled rust in the cultivated blackberry is concerned, the writer's experimental work is showing that it is perfectly practicable with a small amount of labor to prevent the spread of the rust. Primary infections by spores occur comparatively rarely in nature; thus, if one observes proper care for a period of two or three weeks in early spring as soon as the first leaves appear, he can readily detect and destroy rusted canes before the mycelium has spread far into the underground perennial structures and before the spores are shed.
>
> "The eradication of all rust from a field of blackberries where the disease has been of long standing would be a more difficult undertaking. In New Jersey and in other states one can find fields where from 25% to 75% or more of the plants are infected. Such fields should be planted to some other crop unless the grower is willing to follow up and destroy all roots connected with the rusted plants.
>
> "The work at Arlington, Va., affords a very good illustration of the efficacy of removing infected plants as soon as they show rust for the first time. The writer had about 130 cases of primary infection; wherever the rusted canes were pulled up so as to include all parts of the root runner which showed signs of infection, no rust appeared in 1923. In several cases where it was recorded that undoubtedly pieces of roots bearing mycelium were left in the soil, rusted plants showed in 1923."

Literature:

1. Dodge, B. O. A new type of orange rust on blackberry. Jour. Agr. Res. 25: 491-494, 1923.
2. ---------- Systemic infections of Rubus with the orange rusts. Jour. Agr. Res. 25: 209-242. 1923.

Other diseases and injuries

Anthracnose caused by Plectodiscella veneta (Speg.) Burk. - New York (only locally important), Pennsylvania (1% loss), Mississippi, Ohio, Indiana (noted abundant on wild bushes but not in cultivated patches), Illinois (1% loss; probably throughout the state, though not often seen), Iowa (unimportant), Kansas (leafspot only, and then not on upper leaves), Idaho (few isolated reports).

Crown gall caused by Bacterium tumefaciens EFS. & Towns. - Massachusetts, Pennsylvania (bad in some fields, loss .5%), Texas (prevalent, loss 5%), Wisconsin (serious, all nurseries in Warrens and New London district were refused certificates in 1922, because of this disease, only 8 refused this year, twenty-four nurseries concerned), Washington.

Leaf spot caused by Mycosphaerella rubi (West.) Roark - New Jersey, Texas, Oklahoma, Indiana, Illinois, Iowa, Missouri.

Mosaic, cause unknown - New York (very common where blackberries are grown, loss 5%), Indiana (noted only on wild plants). A disease which appears to be mosaic is also reported by Milbrath as occurring in California.

Blotch caused by Cercospora rubi Sacc., Florida; leafspot caused by Phyllosticta sp., Florida; rust caused by Kuehneola uredinis (Link) Arth. (K. albida Magn.), Indiana; cane blight caused by Leptosphaeria coniothyrium (Fckl.) Sacc., New York, Ohio; double blossom caused by Fusarium rubi Winter, New York (on wild blackberry); fruit mold caused by Botrytis sp., California (very severe in all districts); bluestem caused by Acrostolagmus caulophagus Lawrence, California (very severe in all berry regions of state, particularly in San Mateo County; loss 8%); sooty blotch and fly speck, cause undetermined, but may be due to the fungi which caused these diseases on the apple, New York, Indiana.

CURRANT

Root rot caused by Fomes ribis (Schum.) Gill., was reported as occurring on a white currant variety on the grounds of the New York Agricultural Station at Geneva where it has been established for several years.

Cane disease caused by Nectria sp. Ohio (causing death of canes in Lorain County), Minnesota (Ramsey County), Washington (Spokane County). It is possible that the fungus should be referred to N. cinnabarina which has been studied by Line (2) on currants in Great Britain.

Rust caused by Puccinia grossulariae (Schum.) Lagerh., was reported as being less prevalent than usual in New York and Minnesota. In Wisconsin more than the usual amount was present, Vaughan reporting 10% infection of blossoms, fruits and leaves in one planting. It was also generally distributed in North Dakota.

Leaf spot caused by Phyllosticta grossulariae Sacc. was reported August 29 at Mt. View, New Jersey.

Leaf spot caused by Septoria sp. was reported August 21 at Mt. Morris, Ogle County, Illinois.

Mosaic of Ribes floridum was observed May 6 in Tompkins County, New York, where 50% of the crop was injured according to Perry.

Chlorosis, characterized by a yellow, variegated color of the leaves with retarded growth and fruit development, was reported from Delaware.

Blister rust caused by Cronartium ribicola Fisch. von Wald. was reported from Connecticut and New York. See white pine.

Leaf spot caused by Mycosphaerella grossulariae (Fr.) Lind. Reported only from New York, Pennsylvania and Iowa, although it undoubtedly occurs over a wide range. In Iowa a loss of 5 percent is reported.

Leaf spot caused by Pseudopeziza ribis Kleb. was reported from New York (less than usual; only one serious case observed in nursery), New Jersey, Wisconsin.

Cane blight caused by Botrysophaeria ribis Gross. & Duggar - New York (very plentiful in Hudson Valley), Delaware (severein local plantings).

Leaf spot caused by Cercospora angulata Wint. - Delaware, Iowa (loss 5%), Kansas (Wilder variety is very susceptible while North Star planted beside the former shows but a trace of this disease - White.)

Recent literature:

1. Barss, H. P. Diseases of currant and gooseberry. Oregon Agr. Exp. Sta. Circ. 42: 8-12. 1923.
2. Line, J. The parasitism of Nectria cinnabarina (coral spot), with special reference to its action on red currant. Brit. Mycol. Soc. Trans. 8: 22-28. 1922.
3. Lovett, A. L. and H. P. Barss. Insect pests and diseases of currants and gooseberries. Oregon Agr. Exp. Sta. Circ. 42: 12. June 1923.

GOOSEBERRY

Leaf spot caused by Septoria ribis Desm.

The Septoria leaf spot of gooseberry was reported as follows in 1923:

New York: Present in Ulster, Duchess, Monroe and Orleans counties. Probably more widespread than these reports indicate. (Guba)
Illinois: Every planting in the state infected but rarely causing marked defoliation. Loss estimated as a trace. First report June 5 at Urbana. (Tehon & Anderson)
Minnesota: Generally prevalent in southern two thirds of state. Relatively unimportant. Loss a trace. (Sect. Pl. Path.)
Kansas: Found causing defoliation in Wyandotte County. (White)
Colorado: Of average prevalence in Colorado. (Learn)

Powdery mildew caused by Sphaerotheca mors-uvae (Schw.) B & C.

Powdery mildew was of average prevalence in Minnesota where it occurs chiefly on the foliage. It was reported for the first time in Colorado where it caused defoliation about Ft. Collins. It was also quite generally prevalent in Idaho and was reported twice from northeastern Washington.

Rust caused by Puccinia grossulariae (Schum.) Lagerh.

This rust is a common one of wide distribution on native gooseberries and often found on cultivated varieties but not usually important. It was reported from New Hampshire, Massachusetts, Connecticut, New York, Wisconsin (reported as destructive from Chippewa County, June 1), Minnesota, Iowa, North Dakota, Kansas (heavy infection observed about Manhattan; leaves, fruit, petioles and fruit pedicels attacked; considerable loss under these conditions - White.)

Other diseases and injuries

Anthracnose caused by Pseudopeziza ribis Kleb. Reported from Connecticut (one report), New Jersey, Delaware (one report), Illinois (severe locally especially in central part of state. Loss 1%), Washington (one report). Apparentl the disease was of more than average severity in Illinois.

Blister rust caused by Cronartium ribicola Fisch. von Wald. - Connecticut (five localities; less than usual. See white pine).

Cane blight caused by Leptosphaeria coniothyrium (Fckl.) Sacc. - Pettis County, Missouri.

Leaf spot caused by Mycosphaerella grossulariae (Fr.) Lind. was reported from New York and Minnesota where it was apparently of average prevalence. It caused considerable defoliation in one nursery in New York.

A mosaic-like disease of gooseberry was reported from Rochester, New York by Kirby.

Rosette - Adams reports what appears to be a hitherto undescribed disease of gooseberries in New Castle County, Delaware. Many of the leaves in the dense growth were yellowed. No cause of the disturbance was found.

Sun scorch was reported at Long Hill, Connecticut, on June 22. The fruit was baked or burned on the bushes. (Clinton)

MULBERRY

The Cercospora leaf spot caused by Cercospora moricola Cooke was "found to be very destructive to a row of mulberry trees in Gainesville, Florida. The trees have apparently been killed by the disease which caused complete defoliation early in the season and frequently killed back some of the young tender twigs." (Weber)

Bacterial blight caused by Bacterium mori Boyer & Lambert emend. EFS. was reported as causing angular, intervenous leaf spots, August 1, in Tippecano County, Indiana by Gardner.

Texas root rot caused by Ozonium omnivorum Shear, was reported on a lot near the Experiment Station in Arizona. (Brown) In Texas it is reported as prevalent, having caused an 8 percent loss in 1923 according to Taubenhaus.

An interesting new disease of mulberry fruits was reported upon by Siegler and Jenkins (1) as occurring in South Carolina and other southern states. The disease is capable of causing considerable loss.

Literature cited:

1. Siegler, E. A., and A. E. Jenkins. Sclerotinia carunculoides, the cause of a serious disease of the mulberry (Morus alba). Jour. Agr. Res. 23: 833-836. 1923.

CRANBERRY

Practically all of the recorded fungus rots of the cranberry have been reported during the past year from one or another of the cranberry growing sections. In Massachusetts, all of the usual fungus rots were found. The amount of damage caused, however, was much less than in 1922. This was apparently due principally to the cool, rather dry weather which has been shown heretofore to be unfavorable to the development and spread of the most important cranberry diseases.

The false blossom (cause unknown) is apparently becoming somewhat more prevalent each year in the bogs of Massachusetts and New Jersey.

In the cranberry bogs on the Pacific coast in Oregon and Washington the diseases were more destructive than in 1922. The most serious cause of fruit rot in those states was Fusicoccum putrefaciens Shear. The Phomopsis rot and Sporonema rots were next in importance. Sclerotinia oxycocci Wor. was quite prevalent and affected many of the berries, especially the variety Bennett Jumbo.

BLUEBERRY, Vaccinium spp. and

HUCKLEBERRY, Gaylussacia spp.

Crown gall caused by Bacterium tumefaciens EFS. & Towns. was reported from Harrison County, Mississippi, on blueberry.

Exobasidium vaccinii (Fckl.) Wor. was reported July 4 from Tompkins County, New York on Vaccinium vitisidaea and on blueberry (Vaccinium sp.). It was also reported on huckleberry from Johnston County, North Carolina, by Fant.

Anthracnose of blueberry caused by Gloeosporium sp. Florida (caused no damage.)

Leaf spot and twig blight caused by Pestalozzia guepini Desm. occurred on blueberry, probably Vaccinium corymbosum, at Toms River, New Jersey.

A blueberry disease of unknown cause was reported from Maine. The two common species there are Vaccinium canadense and V. angustifolium. "It was first noted in the early part of the season as dead and dying patches, often roughly circular in outline. The disease did not progress nor the areas enlarge as the season advanced. The whole situation suggested some adverse climatic condition as the primary cause, but circumstantial evidence was far from conclusive that the condition was the result of dry weather, flooding, lightning, winter killing, or late frosts." (W. J. Morse)

DISEASES OF SUB-TROPICAL FRUITS

CITRUS FRUITS

Prepared by H. R. Fulton

Melanose caused by Phomopsis citri Fawcett

A recent bulletin (4), includes an abundance of information about the melanose diseases of citrus fruits. The occurrence, importance and distribution of the disease are discussed. It is also well described. The causal organism (Phomopsis citri Faw.) has been cultured and inoculation experiments conducted. The disease is effectively controlled by spraying with Bordeaux-oil-emulsion, at certain periods of development of the fruits. The control work is being continued in an experimental way during the present season from the commercial standpoint. (Weber (6)).

Florida: Melanose was reported as being severe this season on account of the early rains coming before the fruits had become immune. Where spraying with 3-3-50 Bordeaux-oil-emulsion had been done the disease was controlled. The spraying should be done 10 to 20 days after the petals have fallen. It is necessary to make the spraying before the rains begin. (Burger)

Melanose is the most important fruit blemish of oranges and grapefruit. It was less prevalent than the average and much less than in 1922. The fruit had reached an almost immune stage when the rainy infection period came in May. Grapefruits are more susceptible than oranges. Bordeaux-oil-emulsion applied just before May rains set in usually gives good commercial control; if applied at an earlier date results usually are not so good. (Winston)

Alabama: Melanose was extremely rare. (Fulton)

Mississippi: Prevalence the same as usual. It was not serious. (Neal and Barker)

Louisiana: Usual prevalence, of slight importance. (Edgerton) Observed in moderate amount on Louisiana oranges on the market. (Fulton)

Texas: Reported by DelCurto and others (5) from the lower Rio Grande Valley of Texas.

Literature:

1. Burger, O. F. Control of melanose of citrus fruits. Proc. Florida State Hort. Soc. for 1923. p. 171.
2. ------------ Melanose control. Florida Grower 28^{20}: 7, 17. Nov. 17, 1923.
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7. Winston, J. R. and J. J. Bowman. Commercial control of citrus melanose. U. S. Dept. Agr. Dept. Circ. 259: 1-8. March 1923.

Stem end rot caused by *Phomopsis citri* Fawcett and *Diplodia natalensis*.Ev.

An important discovery recently made by scientists in the Department of Agriculture (3) is that proper removing of the small knobs or "buttons" which ordinarily are left on citrus fruits, satisfactorily controls both types of stem end rot. The gassing process commonly used for precoloring citrus fruits can be used to accomplish the disbuttoning. Bordeaux-oil-emulsion spraying soon after the fruit is set, at the proper time for melanose control, also prevents a large percentage of Phomopsis stem end rot in the mature fruit. Pruning out dead wood in the spring, through elimination of sources of infection, materially lowers the percentage of Diplodia stem end rot. Prompt shipment at low temperatures is another practical means of control.

Florida: Was reported from all sections in the State. In some groves the disease was rather severe. This disease appears only on ripe fruit or fruit almost ripe. (Burger)

About the same as preceding year. Occurs throughout the citrus belt. All commercial varieties are susceptible. Melanose control through spraying reduces this decay. (Winston)

Alabama and Mississippi: The two causal organisms are widely distributed on dead wood in Satsuma orange orchards, but fruit infection is rare, and not yet commercially important. (Fulton)

Louisiana: Considerable Diplodia and moderate Phomopsis stem end rot in Louisiana oranges on the market. (Fulton)

Literature:

1. Burger, O. F. Citrus stem end rot. Citrus Industry. . $\overset{9}{4}$: p. 14. Sept. 1923.
2. Winston, J. R. and J. J. Bowman. A preliminary report on the control of stem end rot of citrus fruits by the removal of stems during the coloring process. Proc. Florida State Hort. Soc. for 1923. p. 177.
3. Winston, J. R., H. R. Fulton., J. J. Bowman. Commercial control of citrus stem end rot. U. S. Dept. Agr. Circ. 293: 1-10. Oct. 1923.

Scab (causal fungus erroneously named *Cladosporium citri* (pro tem) Massee)

Florida: The disease was rather severe this spring on the young fruit and tender twigs and leaves. Cool and rainy weather favored the development of scab. (Burger)

Grapefruit was affected somewhat less than the average year, and on the whole the disease was of minor importance, due to the fact that the cool and rainy weather came late in the spring after fruit had reached a non-susceptible size. Bordeaux-oil-emulsion is more effective than lime-sulfur solution, and more than one application is usually required for commercial control. (Winston)

In nurseries the prevalence was about the average, and much damage was done throughout the citrus belt, infection occurring on expanding leaves in spring, summer and fall. Sour orange and rough lemon root-stocks are very susceptible, grapefruit is resistant, and round orange practically immune. Bordeaux-oil-emulsion applied at intervals of 3 or 4 weeks usually gives good commercial control. (Winston)

Alabama: General in southern counties, sometimes causing high percentage of injury and large loss on Satsuma oranges. Controlled where proper spray schedule was used. (Miles)

More prevalent than the average year. Summer flush of growth badly affected due to unusual summer rains. Spring infection of Satsuma fruit sometimes as high as 40% where no control was practiced. Protection of very young fruit with Bordeaux-oil-emulsion gives satisfactory control. (Fulton)

Mississippi: General in the citrus area, causing early shedding and unmarketable fruit of Satsuma oranges. Prevalence about the average. (Neal and Barker)

Scab quite prevalent on summer growth. Usually controlled on the fruit by spraying. (Fulton)

Louisiana: More prevalent than usual on fruits and leaves of Satsuma oranges in southern section of the state. (Edgerton)

Texas: Due to abnormal moisture conditions in the eastern Gulf Coast Section fruit of susceptible varieties, especially Satsuma oranges, showed more than usual damage. Leaves were deformed and twigs injured. The disease is not of importance in the lower Rio Grande Valley. (DelCurto)

Porto Rico: Severe in some places. (Cook and Toro)

Literature:

1. Peltier, G. L. and W. J. Frederick. Relative susceptibility of citrus fruits and hybrids to Cladosporium citri Massee. Jour. Agr. Res. 24: 955-959. June 16, 1923.
2. Tanaha, Tyôzaburô. A brief history of citrus scab in Japan. Phytopath. 13: 492-495. Nov. 1923.
3. Tower, W. V. Citrus scab. Porto Rico Agr. Exp. Sta. Agr. Ext. Note 53. (Reprinted in Trop. Agr. 60: 224-226. 1923)
4. Weber, G. F. Field work in Florida during the year on disease control. Quart. Bul. State Plant Board Florida. 8: 1-8. Oct. 1923.
5. Winston, J. R. Citrus scab; its cause and control. U. S. Dept. Agr. Bul. 1118: 1-39. Jan. 26, 1923.
6. Winston, J. R. Spraying for citrus scab. Florida Grower, 27^6: 7. Feb. 10, 1923.

Canker caused by Bacterium citri (Hasse) Jehle

In Florida additional infected trees (eleven during 1923, and all but one of these during the first half of the year) have been found and destroyed in the Davie section. No new properties were reported. (Burger)

In Mobile county (Alabama) infection was discovered on a few trees only of Citrus trifoliata stock. These were immediately destroyed and no further infections were found. (Miles)

In Louisiana Edgerton reports about the same prevalence in the southern part of the state as during the preceding year.

Literature:

Anon. Report of citrus canker eradication (in Florida) for the quarter ending December 31, 1923. Quart. Bul. Florida Plant Board 8: 74. Jan. 1924.

Newell, W. Citrus canker eradication department. Quart. Bul. Florida State Plant Board 7: 87-95. 1923.

Stirling, Frank. The present status of citrus canker. Citrus Industry. 4^{10}: 22, 24. Oct. 1923.

Weber, G. F. Field work in Florida during the year on disease control. Quart. Bul. State Plant Board Florida. 8: 1-8. Oct. 1923.

Citrus blast and black pit caused by Bacterium citriputeale C. O. Smith

According to Fawcett, Horne, and Camp (1), black pit is most commonly met with on lemons in southern California, and blast occurs most frequently on leaves and twigs of oranges and grapefruit in the northern parts of the State. The organism is said to be widely distributed throughout the citrus regions of the State. In addition to citrus trees the organism can be transferred readily to leaves and twigs of some of the California live oaks. Injuries, low temperatures, and moisture were found important factors in the development of the disease.

Literature:

1. Fawcett, H. S., W. T. Horne, and S. F. Camp. Citrus blast and black pit. California Agr. Exp. Sta. Tech. Paper 5: 1-36. May 1923.

Lime withertip caused by Gloeosporium limetticolum Clausen

Florida: About the same as usual. This major lime disease causes twig blight, leaf spot and fruit scab wherever Key limes are grown in the state. Occasional applications of Bordeaux-oil-emulsion are an effective check. (Winston)

Anthracnose and withertip attributed to Colletotrichum gloeosporioides Penz.

Florida: Anthracnose was reported from one section as doing considerable damage to the fruit. In the northern section of the State leaves that had been injured by the frost on February 19, 1923, showed considerable infection from this fungus. Withertip was reported from several sections of the State. There was in some places a rather severe epidemic of this disease. In young nurseries where the water had been high and injured the trees the disease was very severe. (Burger)

Anthracnose was of minor importance and seemed to follow too great fluctuations of soil moisture. Withertip seems to be the result of starvation and other devitalizing influences. Pruning out of dead wood, fertilization and insect control are almost always followed by prompt and complete recovery.

Alabama: Withertip not generally important. Severe in a few badly neglected groves. (Miles)

Mississippi: Withertip is general in the citrus area, but does little damage. (Neal and Barker)

Texas: Twig and fruit injury on grapefruit were more conspicuous than in 1922 in the lower Rio Grande Valley. (DelCurto)

Blossom-end rot associated with *Alternaria citri* Pierce and sometimes other fungi

Florida: Was rather prevalent through the State. Extreme rainy weather during summer probably favorable for its development. Reported on Ruby, Blood, Parson Brown, Pineapple, Jaffa, Valencia and Tangerine oranges. Later ripening varieties suffered least. Infection in some groves varied from 5% to 25%. (Burger)

Worse than usual, but of minor importance. Have not seen satisfactory results from usually prescribed treatments. (Winston)

California: One report of severe damage from fruit drop of Navel oranges.

Blue mold rot caused by *Penicillium digitatum* (Fr.) Sacc. and *P. italicum* We

Florida: About the average amount. (Fulton)

Alabama and Mississippi: Practically none, due to care in handling fruit and to dry, bright, cool weather during shipping season. (Fulton)

Reported on oranges marketed in Connecticut. (Clinton)

Foot rot attributed to *Phytophthora terrestris* Sherb.

Florida: Was reported as doing damage to some nursery trees. It is rather prevalent in old seedling orange groves. It is worse on poorly drained land than on any other type of soil. (Burger)

About the same prevalence as usual. Is a major disease among old seedling orange trees. (Winston)

Miscellaneous diseases, parasites known or suspected

Brown rot caused by Pythiacystis citrophthora Sm.& Sm. was reported to have been found on a lemon fruit grown in a greenhouse at New Brunswick, N. J. (Dept. of Plant Pathology). It occurred to some extent on lemons in the lower Rio Grande Valley of Texas. (DelCurto)

Gummosis caused by the above organism was reported to have killed a number of citrus trees in Arizona.

White mold rot caused by Oospora citri-aurantii (Ferr.) Sacc. & Sydow was of general occurrence in Satsuma orange groves of Alabama and Mississippi, following insect punctures in ripening fruit. No direct loss could be attributed to this fungus. (Fulton)

Felty fungus girdle caused by Septobasidium pedicillatum (Schw.) Pat. was reported by Burger as being very common in Florida during the year, and by Edgerton as having been noted on orange in St. Tammany Parish, Louisiana.

Algal disease caused by Cephaleuros virescens Kunze was reported by Burger from various localities in Florida, with some killing back of young branches; control was reported by spraying with lime-sulfur. Winston reports possibly more than usual, being most prevalent in certain moist hammock sections; spraying with Bordeaux-oil-emulsion is said to be especially effective if applied when the parasite takes on a reddish color.

Cassytha sp., (Lauraceae) a parasitic flowering plant of vine-like growth "is especially abundant on the lower East Coast of Florida. It is not considered a serious enemy of citrus fruits." (H. J. Wheeler)

Damping-off attributed to Rhizoctonia sp. caused considerable complaint because of the effect on citrus seedlings in Florida, according to Burger.

Scaly bark and nailhead rust attributed to Cladosporium herbarum var. citricolum Fawcett. Florida: "This disease seemed to spread slightly during the past year. The quarantined areas were increased by the addition of new property found infected." (Burger)

Sooty mold caused by Meliola sp. reported as common in Florida and Porto Rico.

Tearstain in Florida, according to Winston, is a manifestation of rust mite injury in at least 99% of the cases. "Grapefruits are more susceptible than oranges. Where rust mites do not occur in Florida, or where these insects are controlled, tearstain is absent; where mites are permitted to become abundant, tearstain is a very common blemish."

Citrus nematode, Tylenchulus semipenetrans Cobb, was reported by E. E. Thomas (13) as being most prevalent in California in the older citrus sections. The amount of infestation varies greatly in different districts.

Miscellaneous diseases, cause unknown or non-parasitic.

Gummosis, cause unknown, was reported from Florida by Winston, Texas by DelCurto, and Porto Rico by Cook and Toro. Burger attributed a particular case of bark gummosis to Diplodia sp.

Psorosis, cause unknown, was reported by Winston as being about the same as in 1922 in Florida. DelCurto reports it as being quite serious, along with gummosis, in the lower Rio Grande Valley of Texas.

Blight cause unknown - Florida. Was serious in certain sections of the State, loss and removal of trees in certain groves along the East Coast amounted to 33%. (Burger) According to Winston the prevalence was somewhat greater than usual, in spots throughout the state, but is still a minor disease; no satisfactory treatment is known, and the disease is always fatal.

Scaly twig rupture, cause unknown, reported by DelCurto from Hidalgo County, Texas. Grapefruit, oranges, and lemons are attacked, grapefruit more severely. The period of greatest injury was June.

Black melanose, cause unknown, a leaf disease of minor importance was reported by Winston as being more prevalent than usual in Florida.

Die-back, cause unknown, was reported by Burger and by Winston to be of major importance throughout the citrus belt in Florida, being especially serious on the light sandy ridges. Winston reports that bluestone applied to the soil like fertilizer, or to the foliage as Bordeaux spray usually gives excellent results.

Mottle leaf and chlorosis, seemingly an effect of excessive lime in the soil, was reported by Winston as being less prevalent in Florida, and by Miles as being important in Alabama.

Green spotting, caused by bruising the fruit so that the oil cells are ruptured, was described by Burger and DeBusk in Press Bulletin No. 342 of the Florida Experiment Station.

Spray injury, due to both oil spray and to lime-sulfur spray was reported by Burger from Florida. Winston thinks that the dark brown stellate excrescences on fruits and leaves, known as star melanose are probably a type of Bordeaux injury.

Lightning injury to citrus trees was reported by Burger as being rather common in Florida.

Recent literature on miscellaneous citrus diseases:

1. Blanchard, V. F. & Hodgson, R. W. Rebuilding frost injured citrus trees -- A progress report. Calif. Citrogr. 8: 263, 294-295. June 1923.
2. DelCurto, J. M., E. W. Halstead, and H. F. Halstead. The citrus industry in the Lower Rio Grande Valley of Texas. Texas State Dept. Agr. Bul. 75: Mar. - Apr. 1923.
3. Fawcett, H. S. Experiments in bridge grafting and inarching in connection with gummosis of citrus. Calif. Citrogr. 8: 68, 95. Jan. 1923.
4. -------------- Gum diseases of citrus trees in California. California Agr. Exp. Sta. Bul. 360: 370-423. Apr. 1923.
5. -------------- Gummosis of citrus. Jour. Agr. Res. 24: 191-236. Apr. 21, 1923.
6. -------------- Psorosis (scaly bark) of orange trees. Ann. Rep. California Citrus Inst. 3/4: 50-54. May 1923.
7. Ferris, E. B. and F. B. Richardson. The Satsuma orange in South Mississippi. Mississippi Agr. Exp. Sta. Bul. 217: 1923.
8. Lee, H. A. A disease of Satsuma and Mandarin orange fruits caused by Gloeosporium foliicolum Nishida. Philipp. Jour. Sci. 22: 603-615. June 1923.
9. Reed, H. S. and A. R. C. Haas. Effect of sodium chlorid and calcium chlorid upon growth and composition of young orange trees. California Agr. Exp. Sta. Tech. Paper 4: 1-21. Apr. 1923
10. Robinson, T. R. Safeguarding the introduction of citrus plants through improved quarantine methods. Florida Grow. 27^{24}: 6-7. June 16, 1923.

11. Ryerson, Knowles. Efficiency in scaly bark and shell bark control. California Citrogr. 8: 371, 401. Sept. 1923.
12. Stevens, H. E. The present status of spraying and dusting for control of citrus diseases. Proc. Florida State Hort. Soc. 1923. p. 144.
13. Thomas, E. E. The citrus nematode, Tylenchulus semipenetrans. California Agr. Exp. Sta. Tech. Paper 2: 1-19. Feb. 1923.
14. Webber, H. J. The June drop of oranges. Ann. Rep. California Citrus Inst. 3/4: 91-100. May 1923.
15. ------- June drop caused by climatic conditions rather than a fungus growth. Three control methods suggested as tests for this year. Citrus Leaves 3^3: 1-5. Mar. 1923.
16. Weber, George F. Poria cocos developed on tuckahoe found attached to orange tree root. (Abstract). Phytopath. 14: 35. Jan. 1924.
17. Wheeler, H. J. Citrus culture in Florida. Jacksonville, Florida. 1923.

FIG

Leaf blight caused by *Rhizoctonia microsclerotia* Matz was reported from Florida, and Alabama, and from Louisiana for the first time. The disease was very prevalent on the Experiment Station grounds in Florida, according to Weber, and the "affected trees were usually entirely defoliated. Three trees were sprayed with 4-4-50 Bordeaux mixture on May 16 and on June 1 (1922). Not a single infection was found on these three sprayed trees while the three check trees (almost touching the sprayed trees) showed 20 percent infected twigs and the disease was rapidly spreading."

Rust caused by *Physopella fici* (Cast.) Arth. was reported from Florida as the most serious disease of fig trees, causing complete defoliation; from Alabama as not important, although sometimes causing defoliation; and from Louisiana and Texas.

Limb blight caused by *Corticium laetum* Karst. - Alabama (unimportant), Georgia (Last summer some dead wood was noticed in part of an orchard (near Savannah) and was pruned out. This spring a great deal of the disease showed up, affecting most of four trees and smaller portions of some dozen other trees), Mississippi (Harrison County, serious in grove observed), Florida (during the past year has been reported as very serious from several different parts of the state; pruning has proven a very efficient way of controlling the disease), Louisiana.

Root knot caused by *Heterodera radiciola* (Greef) Müll. - Mississippi (general, most serious along Gulf Coast; Celeste somewhat resistant), Texas.

Anthracnose caused by *Glomerella cingulata* (Stonem.) S. & von S., Florida, Alabama, Mississippi, Louisiana; *leafspot* caused by *Cercospora fici* Heald & Wolf, Mississippi; by *Cercospora* sp., Texas; *canker* caused by *Macrophoma fici* Alm. & S. and *root rot* caused by *Ozonium omnivorum* Shear, Texas. *leafspot* caused by *Cercospora bolleana* (Thüm.) Sacc., Alabama (very prevalent but little apparent injury).

Recent literature:

Phillips, Edith H. Checking fig smut. Associated Grower 5 : 20-22. 1923.
Aspergillus niger

AVOCADO

Scab caused by the same fungus as citrus scab, erroneously named *Cladosporium citri* (pro tem.) Massee. Florida: "Of major importance in nurseries; moderately important on bearing trees. Affects leaves and fruit. Usually controlled by applications of Bordeaux mixture." (Winston)

"Scab was the most common and probably caused more loss than all the other known avocado diseases in Florida. It has been reported from every section of the state where the avocado is grown and in certain instances has caused considerable damage. The disease on the foliage was most serious during March, and on the first fruit during May and June." (Weber)

Anthracnose caused by *Colletotrichum gloeosporioides* Penz. was not serious on the fruit, but caused considerable damage to younger twigs and to seedlings in Florida.

"A *Fusarium* sp. was apparently the cause of the excessive premature drop of fruit. It has been isolated from practically all specimens sent to this laboratory. The vascular systems of the stems and of the fruits were in each case badly discolored by this fungus." (Weber)

Other diseases reported from Florida were *leafspot* caused by *Phyllosticta* sp., *blotch* caused by *Cercospora* sp. (rare on leaves and twigs; occasionally found on fruit), *leaf blotch* caused by *Pestalozzia guepini* Desm. var. *vaccinii* Shear following other injuries, *algae and lichens* on the leaves, especially the lower shaded leaves.

Blight caused by *Pestalozzia* sp. - Texas.

MANGO

Anthracnose caused by *Colletotrichum gloeosporioides* Penz. - Florida, Porto Rico (canker, very severe; imported varieties very susceptible - Cook & Toro).

Other diseases reported from Florida were *Pestalozzia guepini* Desm. causing *leafspot*; *Septobasidium pedicillatum* (Schw.) Pat. (felty fungus) on the twigs but not believed to be parasitic; and *Cephaleuros virescens* Kuntze, an alga, causing *leafspot* and killing small twigs.

Fruit rot caused by *Gloeosporium* sp. (severe; attacks finer varieties of native mangoes), and *wither tip* caused by *Diplodia* sp. were reported from Porto Rico by Cook and Toro.

PERSIMMON

Fruit rot caused by *Gloeosporium* sp. was reported from Alabama as locally important on a single variety. Miles stated that "The organism and disease greatly resemble bitter rot of apple. It produces typical bitter rot lesions when inoculated into apple fruits."

The following diseases were reported from Florida: *twig blight* caused by *Colletotrichum* sp., common but not serious; *twig blight* caused by *Phoma diospyri* Sacc., *leafspot* caused by *Pestalozzia guepini* Desm., *rosette*, cause unknown.

BANANA

Leaf and fruit spot caused by *Gloeosporium musarum* C.& M. - Florida (caused extensive losses both by reducing leaf surface and because of fruit injury; very common on fruit on the market and often a limiting factor in its sale), Porto Rico (on all varieties throughout the Island).

Wilt caused by *Fusarium cubense* EFS. - Porto Rico (appears to be very destructive throughout the Island).

Pink mold caused by *Cephalothecium roseum* Cda. - found on leaves in Florida but is apparently only a weak parasite and caused little damage.

DATE

Smut caused by *Graphiola phoenicis* (Mong.) Poit. - Texas, Arizona, Porto Rico.

Leafspot caused by *Exosporium palmivorum* Sacc. - Texas.

PINEAPPLE

Red wilt, probably due to nematodes, *Heterodera radicicola* (Greef) Müll. Florida: Injury about the same as for last few years. A most important pineapple disease. (Winston)

OLIVE

Olive knot caused by *Bacterium savastanoi* EFS. - California (general throughout the state, but most severe in the Sacramento Valley. Loss about 1%. Infection very bad in some orchards. - Milbrath).

GUAVA

Dieback caused by *Colletotrichum* sp., and *leafspot* and *twig blight* caused by *Cephaleuros virescens* Kuntze - an alga, were reported from Florida. *Fruit rot* and *spot* caused by *Glomerella psidii* (Del.) Sheldon was reported from Florida and Porto Rico.

PAPAYA

Leafspot caused by *Pucciniopsis caricae* Earle was reported from Florida serious, causing defoliation in severe infections; plant not extensively grown, o economic loss is small) and Porto Rico (unimportant).

LOQUAT

Leafspot caused by Sphaeropsis malorum Pk. ? - Florida (not important).

CHERIMOYER

Anthracnose caused by Gloeosporium sp. caused a black rot of the fruits in Florida, but the host is not extensively grown.

AGUACATE

Fruit rot caused by Gloeosporium sp. - Porto Rico (severe as a storage disease).

DISEASES OF NUTS

PECAN

Scab caused by Fusicladium effusum Wint.

Scab was generally reported as more prevalent than usual. Losses estimated were 20% in South Carolina, 15% in Alabama, and 10% in Mississippi. Other states from which reports were received are Georgia, Florida, Louisiana, and Arkansas.

Alabama: Very important on susceptible varieties. Total loss in some cases where susceptible varieties were not sprayed. Georgia Giant, Delmas, Pabst, Schley very susceptible; Success scabbing some; Stuart, Russell, Van Deman, Frotscher resistant. (Miles)

Mississippi: Scab has been very destructive the past season all over the state, especially so in the coastal, central, and delta sections. The abundant rainfall which occurred almost every week from May until August was very conducive to scab development and interfered materially with spraying operations for the control of the disease on the more susceptible varieties. Only partial control was obtained on Delmas and Pabst pecans, the two most susceptible varieties in this State. Varieties listed in the order of susceptibility to scab are Delmas, Pabst, Schley, Success, and Alley. Resistant varieties include Stuart, Russell, Van Deman, Money Maker, Hall, Frotscher, Moore, and Tesche. Success seems to be scabbing more seriously than heretofore, and some varieties like Schley are scabbing badly in some localities, while in others they are relatively free from the disease. It may be possible that there is biological specialization of the scab fungus, or enough

> bud variation among certain varieties to cause pronounced difference in their susceptibility or immunity to scab. Dormant spraying with 1-8 lime sulfur followed with summer applications of 4-4-50 or 4-6-50 Bordeaux with oil emulsion added has given the best control of all spraying materials used in our experiments. (Neal & Barker)

Recent literature:

Demaree, J. B. Pecan scab experiments in 1922. Amer. Nut Jour. 18: 4-5. Jan. 1923.

Rosette (cause undetermined)

Rosette was reported from South Carolina, where fewer complaints were received than usual, and from Alabama. Miles reported that the disease was important, causing a loss of 4%. "The disease is general in the southern part of the state in light sandy soils. A four-year old orchard in land long used for cotton showed 93% of the trees badly rosetted. The disease is most prevalent in soils which have grown cotton for a long time, in satsuma orchards, and in soils lacking in humus generally."

Black pit (non-parasitic)

Black pit was reported as very severe in South Carolina by Moore, who stated that the disease "practically ruined pecans in every grove. The yield was cut in half." It caused considerable loss also in Mississippi, where it was more prevalent than usual. Neal and Barker report as follows:

> "Black pit has been reported from many counties over the state this season. It has been particularly serious in the coastal counties. Delmas, Schley, Pabst, Stuart, and Van Deman have been found to be affected in the order named. The disease seems to be very serious on Delmas, Schley, and Pabst pecans. The Russell, Atlanta, Hall, Money Maker, and Success seem to be less seriously affected, with the first four being practically immune. This trouble is evidently associated in some way with excessive and continuous rainfall. Dry weather the previous season does not appear to be accountable for it. On the other hand, it is possible that conditions which would bring about imperfect pollination may be responsible for this abnormal development of the nuts."

Severe losses due to this trouble were reported from Atlanta, Georgia, and Hope, Arkansas.

Other diseases and injuries

Anthracnose caused by Glomerella cingulata (Stonem.) S. & von S. was reported from Florida, Alabama, and Mississippi. In Mississippi, according to Neal and Barker, the disease is "rather serious. It appeared rather late on practically mature nuts in most cases. Badly diseased nuts are apparently not well filled. It is common on most varieties, particularly Stuart, Delmas, and Van Deman."

Nursery blight caused by Phyllosticta caryae Peck was reported by Weber as very common and frequently, but not generally serious in nurseries in Florida; and from Alabama by Miles as general on nursery stock and sometimes found on weakened trees.

Brown leafspot caused by Cercospora fusca Rand was said to be common and locally important, causing premature defoliation in many cases, in Florida and Alabama, and was also reported from Carlsbad, New Mexico. According to Miles "Spraying for scab gives complete control of this trouble. There is evidence that weakened trees are more subject."

Powdery mildew caused by Microsphaera alni (Wallr.) Salm., South Carolina, Florida, Mississippi; crown gall caused by Bacterium tumefaciens EFS. & Towns., South Carolina, Mississippi; black spot of bark caused by Septobasidium pedicillatum (Schw.) Pat., and by Myriangium tuberculans Miles, Mississippi; kernel spot, Alabama; pink mold caused by Cephalothecium roseum Cda., twig blight due to Fusarium sp., dieback caused by Botryosphaeria berengeriana De Not., a bacterial twig blight, organism undetermined, and leafspot due to lichens, Florida.

Winter injury was severe in Mississippi. Neal and Barker stated that "Trees under four years old were seriously injured by the February and March freezes, particularly where fertilized and cultivated late in the fall of 1922." Winter injury was also reported from South Carolina.

Cold injury - frequently reported but not serious in Florida.

Recent literature:

Higgins, B. B. Winter injury to pecans. Amer. Fruit Grow. Mag. 44: 13. Jan. 1924.

ENGLISH WALNUT

Bacterial blight caused by Bacterium juglandis (Pierce) EFS. - Delaware (usually severe in seasons when fire blight of apple is prevalent; generally found in small home plantings - Adams), Washington, California (loss about 2 percent). Specimens of walnuts affected with a trouble resembling this disease were received by the Cornell Department of Plant Pathology from a field assistant in Ontario County, New York.

Leafspot caused by Marssonia juglandis (Lib.) P. Magn. - Illinois.

Twig blight and black spot of nuts due probably to drought - New Mexico. Crawford reported that "Many of the young fruit spurs and twigs are entirely dead and some of the nuts have black spottings on their surfaces." Specimens were examined by M. B. Waite who said that the trouble was probably due to drought.

Recent literature:

Anon. Walnut-blight. Introduction of immune variety by the Department. New Zealand Jour. Agr. 27: 25. July 1923.

Juglans hindsii is the native California black walnut. It is suitable for use as a stock since it is immune to the bacterial blight, which had become so destructive in New Zealand that the Department did not encourage walnut planting.

ALMOND

Shot hole caused by Coryneum beijerinckii Oud. - California, said to be more injurious than in 1922.

Black heart caused by Verticillium sp. - see apricot.

Rosette of peach was transmitted by McCormick (see peach) from peach to apricot, from apricot to bitter and Texas seedling almonds, and from the almonds back to peach. It was also transmitted from wild plums to bitter almonds.

COCONUT

Wilt, apparently caused by Pythium sp., was reported by Weber (1) from Florida. "The leaves become yellow and wilt one after another until the bud falls from the top of the plant."

Bud rot, cause undetermined, was reported as doing considerable damage near Palm Beach, Florida. In Porto Rico, according to Cook and Toro "Bud rot occurs over the entire Island but is most severe in the western part. It is less severe than the Cuban bud rot and we believe it to be different."

Recent literature:

Cited

1. Weber, G. F. Field work in Florida during the year on disease control. Quart. Bul. St. Plant Bd. Florida 8: 1-8. Oct. 1923.

Not cited

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Aphelenchus cocophilus Cobb causes red-ring disease of coconut in the West Indies.

McRae, William. Inoculation experiments with Phytophthora palmivora Butl. on Borassus flabellifer Linn. and Cocos nucifera Linn. Mem. Dept. Agr. India Bot. Ser. 12: 57-70. July 1923.

Reinking, O. A. Comparative study of Phytophthora faberi on coconut and cacao in the Philippine Islands. Jour. Agr. Res. 25: 267-284. Aug. 11, 1923.
Causes coconut budrot, and blackrot and canker of cacao.

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DISEASES OF FIELD AND VEGETABLE CROPS IN THE UNITED STATES IN 1923

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INTRODUCTION

The discussion of field and vegetable crop diseases which follows is summarized from reports sent to the Plant Disease Survey by collaborators from the various states, contributed by various members of the staff of the Bureau of Plant Industry, and gleaned from current literature. When few or scattering reports are submitted the resulting summary must necessarily be disappointing. It so happens that collaborators often pass by some of the common and widespread diseases with brief, if any, mention, which causes the summary to be more or less fragmentary. In some states the time of collaborators is so completely occupied with experiment station or teaching work that little opportunity is available for the Plant Disease Survey. It is much to be desired that more numerous and complete reports may be received next year.

OUTSTANDING OBSERVATIONS

The most outstanding observation of the season is undoubtedly the almost entire absence of potato late blight in all the major potato producing states if the country. At one time there was considerable Phytophthora infestans on the potato foliage in Florida, but the economic loss from rot from this source was very minor. This is an illustration of the dependence of crop diseases, as well as the crops themselves, upon the conditions of environment under which they are grown. This point may be further illustrated by the considerable loss from downy mildew caused by Peronospora effusa which occurred in Connecticut, Long Island, and New Jersey trucking districts following the excessive rains the first week in June. After the rain the spinach tissues were soft and conditions highly favorable for rapid growth and spread of the fungus. The conditions of temperature and light as well as moisture are important in determining whether a disease will develop from minor to major proportions or the reverse. Goss of Nebraska reports that potato mosaic was made evident in early season by heavy rainfall, low temperature, and deficient sunlight, while following mid-summer conditions there was little mosaic to be seen. The various Fusarium diseases have long been associated with high temperature, while tobacco black root rot is favored by cool conditions.

Diseases reported from new states in 1923

(For details see text)

POTATO - Heterodera radicicola, Kansas (found in the field for the first time)
Rhizoctonia crocorum, New York
Spindle tuber, Vermont
Verticillium alboatrum, Connecticut
Yellow dwarf, Florida

TOMATO - Bacterium vesicatorium, Missouri
Cladosporium fulvum, Kansas (found in the field for the first time)
Fusarium lycopersici, Minnesota (said to be the first authentic record of its occurrence)
Phytophthora terrestris, West Virginia

SWEET POTATO - "Mosaic", Kansas
Sclerotinia sp., New Jersey
Sclerotium rolfsii, New Jersey

BEAN - *Bacterium flaccumfaciens*, Michigan, Montana, Maryland, District of Columbia; France; Germany; (previously reported only from South Dakota)
Fusarium sp. (dry rootrot), Washington

LIMA BEAN - *Diaporthe phaseolorum*, Mississippi
Nematospora phaseoli, Illinois

ONION - *Urocystis cepulae*, Minnesota

CABBAGE & KALE - *Fusarium conglutinans*, California

RADISH - *Mucor* sp. (damping-off) Connecticut

CANTALOUPE - *Cladosporium cucumerinum*, Delaware
Septoria cucurbitacearum, Delaware
Pseudoperonospora cubensis, California

CUCUMBER - *Septoria cucurbitacearum*, Delaware

PUMPKIN - *Cercospora cucurbitae*, Delaware
Colletotrichum lagenarium, Delaware

SQUASH - *Bacillus tracheiphilus*, Kansas

COTTON - *Bacterium malvacearum*, Illinois

TOBACCO - *Bacterium tabacum*, Illinois

ASPARAGUS - *Cercospora* sp., California

RHUBARB - *Phyllosticta straminella*, Kansas
Phytophthora cactorum, Michigan
Phytophthora parasitica rhei, Delaware
Phytophthora, species undetermined, Missouri

New diseases, 1923
(For details see text)

TOMATO - *Olpidium brassicae*, on roots, greenhouse, University of Wisconsin (new to this country)
Oospora lactis parasitica, new variety in the vicinity of Arlington, Va., and Washington, D. C., and on fruit shipped from the Gulf States.
Phytophthora mexicana, new species, on fruit shipped from Mexico

SWEET POTATO - Cercospora batatae, Florida (new to this country)
Mottle necrosis and internal breakdown

LIMA BEAN - Bacterium viridifaciens, n. sp., described from Wisconsin: reported by collaborators from New York and Indiana

ONION - Cercospora duddiae, n. sp., Philippine Islands
Sclerotium cepivorum, Virginia (only one other authentic report of its occurrence in this country - from Oregon in 1918)

CABBAGE - Olpidium brassicae (see tomato)

LETTUCE - Cercospora lactucae n. sp., Philippine Islands

PEA - Fusarium martii pisi n. var., general
Fusicladium sp. and Phyllosticta sp. causing black leaf, Utah

TOBACCO - Bacterium melleum, n. sp., Kentucky, Wisconsin
Olpidium brassicae (see tomato)

SPINACH - Fusarium spinaciae n. sp., Idaho
Fusarium sp., Texas

New hosts of previously described organisms

Bacterium malvacearum - Arizona wild cotton, Thurberia thespesioides (inoculation)

Bacterium solanacearum found on tango (Chrysanthemum coronarium), Philippine Islands

Bacterium tabacum found on Lima bean, Massachusetts

Entyloma australe found on Physalis pruinosa, New York (not previously reported on this species)

Sclerotinia libertiana on udo (Aralia cordata)

Verticillium alboatrum on udo

DISEASES OF POTATO

Potato seed treatment

The following are some of the more important papers on this subject issued during the past year.

Bisby, G. R. Potato seed tests in Manitoba. (Abstract) Phytopath. 14: 58. January 1924.

Blodgett, F. M. Time-temperature curves for killing potato tubers by heat treatments. Phytopath. 13: 465-475. November 1923.

Claus, Eugen, Gustav, Köck, und Erwin Janchen. Neuere Erfahrungen über den Einfluss von Uspulun und Uspulunbolus auf die Kartoffelerträge. (Recent experiments on the effect of Uspulun and Uspulunbolus on the yield of potatoes.) Oesterreich Zeitschr. Kartoffelbau 2: 29-30. February 17, 1923. Results of 4 tests.

Gilman, J. C. and J. E. Melhus. Further studies on potato treatment. Phytopath. 13 341-358. August 1923.

White, R. P. Loss of strength of mercuric chloride solutions used for treating potatoes. (Abstract) Phytopath. 14.58. January 1924.

Potato spraying

Spraying, recognized as one of the necessary practices in connection with raising potatoes, is discussed in the following references.

Recent literature:

Chittenden, F. H. and W. A. Orton. Increasing the potato crop by spraying. U. S. Dept. Agr. Farm. Bul. 1349: 1-22. 1923.

Cook, F. C. The influence of copper sprays on the yield and composition of Irish potato tubers. U. S. Dept. Agr. Bul. 1146: 1-27. April 5, 1923.

Evidence is presented to show that Bordeaux and other copper sprays increased the starch and nitrogen constituents of the potato tubers and consequently made them more valuable for food and industrial purposes.

Leach, J. G. Spraying vs. dusting for potatoes. (Abstract) Phytopath. 14: 57. January 1924.

Martin, W. H. Ten years of potato spraying in New Jersey. New Jersey Agr. Exp. Sta. Bul. 383: 1-32. April 1923.

Rosa, J. T., Jr. Note on an indirect effect of spraying potatoes with Bordeaux mixture. Amer. Jour. Bot. 10: 113-116. 1923.

Early Ohio variety sprayed with Bordeaux remained green 3 weeks longer, and yielded over one-third more than control plants. The quality of the increased yield was depreciated because of marked development of knobby second growth.

Rosa, J. T., Jr. Spraying Irish potatoes. Missouri Agr. Exp. Sta. Bul. 198: 1-6. 1923.

Potato seed certification

The practice of seed certification continues to give satisfaction. It provides one of the best ways known for the location of strains of seed relatively free from dangerous diseases.

Recent literature:

Brown, B. A. & W. L. Slate. Studies on certified seed potatoes. Connecticut Agr. Exp. Sta. Bul. 114: 285-296. May 1923.

Partridge, George. Potato inspection and certification in Canada, 1922. Agr. Gaz. Canada 10: 121-123. March - April 1923.

Late blight caused by Phytophthora infestans (Mont.) DeBary

The whole country was remarkably free from late blight in 1923. At one time it was quite prevalent on the foliage in Florida, but caused little rot at digging time. The occurrence of late blight was noted by collaborators in Maine, New Hampshire, Vermont, Massachusetts, New York, Pennsylvania, Maryland, West Virginia, North Carolina, Florida, Alabama, Michigan, Wisconsin, Arizona, and at high altitudes in California. States where late blight sometimes occurs but which gave a negative report this year are: Rhode Island, Connecticut, New Jersey, Ohio, and Iowa.

Table 17. Dates of earliest appearance of late blight in 1923, according to collaborators.

Date	Place	Date	Place
Feb. 20	Federal Point, Fla.	Aug. 30	Mountain Section, W. Va.
July 15	Somerset County, Penn.	Sept. 10	Colebrook, N. H.
July 18	Newland, N. Car.	Sept. 26	Phillips, Wis.
Aug. 2	Middlesex Co., Mass.	Oct. 1	Caro, Mich.
Aug. 30	Wyoming Co., N. Y.		
Aug. 30	Maine		

The dry weather which prevailed throughout the country in midsummer is given by collaborators as the probable explanation for the minor importance of late blight. Giddings (West Virginia) reports that there was plenty of rain but that the rainy periods were followed by hot, sunny weather which nullified the effect of rain. In many instances the rains did not come until the crop was nearly mature and beyond the period of injury.

In the potato spraying work reported from New Hampshire, (1) experiments were conducted on the effect of pressure and number of nozzles used in the control of late blight. Bordeaux 8-4-50 was applied four times at intervals of two weeks. Late blight did not develop, so no data were obtained. It was noted that neither the number of nozzles used nor the amount of mixture applied per acre had any stimulating effect on the yield of the plants.

The Rhode Island Experiment Station, (2) reports that plats dusted with

Bordeaux yielded only about 70 per cent of those where the fungicide was applied as a spray.

Recent literature:

Cited

1. Butler, O. Spraying potatoes. New Hampshire Agr. Exp. Sta. Bul. 208: 1-24. 1923.
2. Anon. Spray v. dust for potato blight. Rhode Island Agr. Exp. Sta. Bul. 193: 1-4. 1923.

Not cited

Kursanov, Leo. The history and present situation of the study of Phytophthora infestans. Trav. Sect. Mycol. et Phytopath. Soc. Bot. Russie. 1: 107-116. 1923. In Russian.

Martin, W. H. Late blight of potatoes and the weather. New Jersey Agr. Exp. Sta. Bul. 384. p. 23. 1923.

Uppal, B. N. Spore germination of _Phytophthora infestans_. (Abstract) Phytopath. 14: 32-33. January 1924.

Early blight caused by _Macrosporium solani_ E. & M.

Early blight was present throughout the country but in only one section, namely North and South Carolina, was the loss more than nominal, being 5% in North Carolina and 10% in South Carolina. This disease was reported as relatively more prevalent than last year in Delaware, South Carolina, Indiana, Illinois, Iowa, South Dakota, Utah, and Idaho. It was reported the same in Maryland and less prevalent than last year in Maine, Connecticut, New York, West Virginia, Kentucky, Wisconsin, Minnesota, and Kansas. It seems to be coextensive with the crop but does not appear until the tubers are approaching maturity, hence is of minor importance.

Potatoes

Table 18 Dates of earliest recorded appearance of early blight, 1923.

Date	Place	Date	Place
Mar. 30	Florida	July 30	South Dakota
May 7	Chestertown, S. C.	Aug. 1	Lake of the woods, Minn.
May 22	Baton Rouge, La.	Aug. 11	Oneida Co., Wis.
May 30	Graham Co., Ariz.	Aug. 24	Traill Co., N. D.
June 5	Duplin Co., N. C.	Aug. 29	Essex Co., N. Y.
June 12	Hamilton Co., Ill.	Sept. 1	New Hampshire
June 19	Newark, Del.	Sept. 1	Vermont
July 20	Middletown, Conn.	Sept. 25	Kentucky

Martin, of New Jersey, considered that the drought of midsummer was responsible for the relatively small losses due to the early blight.

The Early Ohio variety was mentioned by Weniger, North Dakota, as being most seriously infected.

Literature

Whetzel, H. H. The Alternaria blight of potatoes in Bermuda. Phytopath. 13: 100-103. March 1923. No. 3.

Common scab caused by *Actinomyces scabies* (Thax.) Güssow

Common scab, as usual, is one of the most widespread diseases reported on potatoes. The losses caused by it are due to disfigured and unsalable tubers rather than an actual reduction in quantity. The dates of first appearance are coincident with harvesting of the crop.

Dry soil conditions are given as favoring the development of common scab in New York, New Jersey, Kentucky, Wisconsin, and Minnesota. This is in conformity with the results of experiments reported by G. B. Sanford from the University of Minnesota and the University of Alberta, Canada.

An interesting varietal susceptibility test is reported by W. H. Martin, New Jersey. Tubers were planted on scab infested soil and gave clean tubers as follows: Giant, 62.6%; Burbank, 61.8%; Russet Rural, 57.1%; No. 9, 50.6%; Rural New Yorker, 50.4%; Irish Cobbler, 21.5%, and Green Mountain, only 6.2%. Tehon of Illinois reports Early Ohio highly susceptible.

The results of the application of sulfur for a number of years as it was used on three farms in Kentucky, were reported by J. S. Gardner and are given in the following table.

Table 19. Results of the use of sulfur as an agent in common scab control.

Date	Treatment on first farm	Results
1915	Limed 2 tons per acre for clover	
1917	--	Potatoes 100% unsalable
1919	--	" " "
1922	July; inoc. sulfur, 150 lbs. per acre	No benefit
1923	Feb. or Mar.; inoc. sulfur 150 lbs. per acre	Improvement in control but might have been season.
1923	June or July; spraying sulfur, 150 lbs. per acre.	2nd crop practically clean in a bad scab season, but yield reduced about 20%
	Second farm	Results
1922	July; 150 lbs., 300 lbs., 450 lbs., 600 lbs. per acre applied to 4 plots	Slight control with 600 lbs. in fall crop
1923	--	Marked improvement on all 4 plots, no exact data.

Date	Third farm	Results
1921	15 lbs. sulfur to 30 ft. spot	
1922	15 lbs. " " " "	No control
1923	15 lbs. " " " "	No scab

Martin, New Jersey, reports on a test with 600 pounds of sulfur broadcasted, where the amount of common scab was reduced from 84 per cent unsalable in the check to 22.5 per cent unsalable in the treated portion. He has also reported (1) that sulfate of ammonia helps to control scab, while nitrate of soda increased the amount of scab.

Literature

Cited

1. Martin, W. H. Potato fertilizer and scab. New Jersey State Potato Assoc. Hints to Potato Growers. No. 6. October 1923.

Not Cited:

DeLong, W. A. Sulfur and soil acidity. Sci. Agr. 3: 354-356. 1923.

Geise, F. W. Experiments with inoculated sulfur. Preliminary report, VirginiaTruck Exp. Sta. Bul. 42: 259-263. 1923.

"The relative amount of scab control varied in different tests. This may be attributed to varying soil conditions. In view of the harmful residual effect on subsequent crops resulting from the use of excessive amounts of inoculated sulfur, it is believed that on the basis of data obtained with soy beans, spinach, corn and late potatoes, only quantities not exceeding 300 lbs. per acre should be used during any one season on the same land under soil conditions and crop rotation systems prevailing in eastern Virginia." (Exp. Sta. Record 49. Sept. 1923)

Leach, Julian G. and R. C. Rose. Experiments with inoculated sulfur for scab control. (Abstract) Phytopath. 14: 57. January 1924.

Variable results obtained. In few cases an appreciable reduction of scab, in majority of cases little or no control could be detected. In many places there was a decreased yield. The type of soil seems to have much influence on the effectiveness of the treatment.

Lutman, B. F. Potato scab in new land. Phytopath. 12: 241-244. May 1923.

Scab developed on new soil planted with disinfected tubers. Poured agar plate cultures from the soil showed organisms of the Actinomyces chromogenus type. Conclusion: the scab organism is generally saprophytic on cellulose matter in the soil and the parasitism on potatoes is merely secondary.

Martin, W. H. Reduce potato scab - use acid fertilizer. New Jersey Agric. 5: No. 12: 6-7. Dec. 1923.

Millard, W. A. Common scab of potatoes II. Ann. Appl. Biol. 10: 70-88. Feb. 1923. States: Preferential food hypothesis: "According to this theory, the scab organisms are primarily saprophytic living on vegetable remains in the soil. They remain so until their natural food supply is exhausted and develop their parasitic tendencies only under the stress of hunger." Scab organism strongly aerobic, which fact explains decreased amount of disease in wet seasons due to wet soils. (Abst. Rev. Appl. Myc. 2: 519. Nov. 1923).

Sanford, G. B. The relation of soil moisture to the development of common scab of potato. Phytopath. 13: 231-236. 1923.

Sanford, G. B. Some factors influencing the development of potato scab. (Abstract) Phytopath. 14: 58-59. Jan. 1924.

____________ The potato scab problem. Proc. West. Can. Soc. Agr. 2: 71-81. 1922.

Blackleg caused by Bacillus phytophthorus Appel

The amount of blackleg in 1923 was less than the previous season as is shown by the following report from collaborators.

Table 20. Losses due to blackleg 1922 and 1923.

State	Percentage loss		State	Percentage loss	
	1922	1923		1922	1923
Maine	1	trace	Ind.	trace	trace
Vt.	1	trace	Wis.	trace	trace
Conn.	.5	0	Minn.	2	1
N. Y.	trace	trace	N. D.	3	2
Pa.	2	trace	S. D.	trace	trace
Md.	1	1	Kans.	3	trace
W. Va.	trace	0	Utah	2.5	1.5
Va.	2	-	Idaho	.5	.5
Tenn.	1	-	Wash.	trace	trace

The following losses were reported in 1923 from states that did not report the disease in 1922.

1.5% - North Carolina
1% - Florida
0.1% - California
Trace - New Hampshire, New Jersey, Arkansas, Illinois,
Michigan, Iowa, Missouri, Arizona, Nevada.

It is the consensus of opinion that the summer drought was instrumental in checking losses from blackleg. The disease was reported from the following states on the dates given:

May 10.......North Carolina
May 1........Arizona
June 1.......New Jersey
June 10......Kansas
June 11......New York
June 18.......Illinois
June 20.......Indiana
July 1........New Hampshire
July 30.......South Dakota
August 5....... Wisconsin

The control of blackleg is reported on by Miss Weniger of North Dakota, as follows:

> "Indications are that treating after cutting is responsible for better control of the disease. Growers are thus able to detect infected tubers, discard them and further disinfect the surfaces of cut tubers which might be contaminated. Counties where treating has been practiced before cutting have not had as good control of blackleg as in those where treating follows cutting of the seed pieces.

Literature

Jennison, H. M. Potato blackleg with special reference to the etiological agent. Ann. Missouri Bot. Gard. 10: 1-72. February 1923. Abstract of above given in Pl. Dis. Bul. Supplement 26: 30. 1923.

Paine. S. G. & H. Chadhuri. The blackleg disease of the potato. On the relationship of *Bacillus atrosepticus* and *Bacillus solanisaprus*. Phytopath. 13: 359-361. Aug. 1923. Experiments clearly establish the two organisms as distinct.

Stem rot and black scurf caused by *Rhizoctonia solani* Kuhn (*Corticium vagum* DC.)

Rhizoctonia continues to be one of the most widespread diseases of potato. It produced, in general, smaller losses in 1922 than in 1922 as indicated in the following table comparing the two years. Exceptions to this statement are Maryland, Minnesota, and Iowa, where an increase occurred, and in New York, Michigan and North Dakota where it caused the same loss in both years.

Table 21. Losses caused by Rhizoctonia in 1922 and 1923.

State	Percentage of loss		State	Percentage of loss	
	1922	1923		1922	1923
New York	5	5	Iowa	2	4
New Jersey	trace	trace	North Dakota	3	3
Maryland	2	3	South Dakota	3	1
Pennsylvania	3	trace	Kansas	15	12.5
Florida	trace	-1	Arizona	5	1
Indiana	trace	.1	Utah	4	2.5
Michigan	5	5	Idaho	8	5
Wisconsin	2	1	Washington	8	2
Minnesota	2	3			

Damage from this disease occurs to underground parts soon after the tubers are planted and may come from either tuber or soil infection. Where potatoes are planted in cool soil, either in the northern section of the country or in the mountain region of the South and West, more damage is found than where potatoes are planted in warmer soil. Richards, of Utah, notes a loss of 50% in 1918, when the June mean temperature was 20.1°C as contrasted with 15.4% loss in 1919, when the June mean temperature was 23°. The critical temperature seems to be about 21°C.

No observations were made regarding resistance or susceptibility of different varieties of potatoes to the Rhizoctonia diseases. (1)

The control of Rhizoctonia is usually brought about by treating the seed with corrosive sublimate. Hot formaldehyde treatment is recommended in Iowa. Where the soil is infected, treatment is of reduced value. The use of hot corrosive sublimate is being used to some extent in New York.

Literature

Cited

1. Richards, B. L. Further studies on the pathogenicity of Corticium vagum on the potato as affected by soil temperature. Jour. Agr. Res. 23: 761-770. 1923.

Not Cited

Dorst, J. C. Aantosting van de aardappelplant door Rhizoctonia solani en haar bestrijding door sublimaat. (Rhizoctonia solani on potato and its control with sublimate) Tijdschr. Plantenz. 29: 97-106. June 1923. (Abst. Rev. Appl. Myc. 2: 572. Dec. 1923 and Bot. Abst. 13: entry 310. Jan. 1924.)

The disease is stated to be very prevalent on sandy clay soil and on reclaimed pasture land in Holland. There is a tendency to form aerial tubers in latter soil type. Applications of fresh organic manure appear to increase the disease. Eradication of the causal organism from the soil can only be gradually accomplished by suitable crop rotation, by the removal of weeds, and potato refuse, and by seed disinfection with corrosive sublimate (1%) for 1 1/2 hours. The temperature of the water should not be lower than 5°C or tuber injury may result.

Matsumato, Takashi. Further studies on physiology of Rhizoctonia solani Kühn. Bul. Imp. Coll. Agr. & For. Morioka, Japan. 5: 64. Jan. 1923.

Müller, K. O. Ueber die Beziehungen zwischen Rhizoctonia solani Kühn und Hypochnus solani Prill. et Del. (On the relations between Rhizoctonia solani Kühn and Hypochnus solani Prill. & Del.) -- Arb. Biol. Reichanst. furLand. und Forstwirtsch. 11: 326-330. 1923. (Abst. in Rev. Appl. Myc. 2: 471. October 1923.)

> "Strains of Hypochnus solani and Rhizoctonia solani were compared on potato plants grown in sterile soil in flower pots or plants in the field, and in pure cultures. The measurements and temperature relations were practically the same. Spores from both sources caused typical Rhizoctonia lesions on underground portions and at the surface of the ground on stems. Discrepancies occurring in some of the strains indicated that H. solani includes a variety of biological forms, ex., two strains grew less rapidly, gave sparse mycelia, and varied in virulence; minor discrepancies probably due to environment and do not invalidate conclusions." (Note by R. E. Vaughan from Rev. Appl. Myc. Abst.)

Fusarium wilt caused by Fusarium oxysporum Schlect.

The Fusarium wilt disease of potatoes was widely prevalent in 1923 but caused minor losses with one exception, New Mexico, where a loss of 10% was reported. No reports were received from the New England States. New York and the north central potato producing states reported less wilt than usual, Maryland the same, and New Jersey and Pennsylvania more than usual.

Table 22. Dates of earliest appearance of Fusarium wilt in 1923.

Date	Place	Date	Place
May 5	Yavapai Co., Ariz.	July 13	Freehold, N. J.
May 18	Marion Co., Miss.	July 26	Pierce Co., Wis.
June 6	Tuscarawas Co., Ohio	Aug.	Cloudcroft, N. M.
June 23	Suffolk Co., N. Y.		

Collaborators in New York, New Jersey, Ohio, and Indiana attribute the reduced amount of wilt to the relatively dry weather which prevailed during the growing season. The Minnesota collaborators state that wilt was aggravated by excessive moisture. This question of weather relations is discussed by Goss. (1)

The control of wilt has been largely brought about in Kentucky by roguing the fields, in North Dakota by crop rotation, stem-ending and corrosive sublimate seed treatment.

Literature Cited

1. Goss, R. W. Relation of environment and other factors to potato wilt caused by Fusarium oxysporum. Nebraska Agr. Exp. Sta. Res. Bul. 23: 1-84. 1923. (Abstracts in Rev. Appl. Myc. 2: 521. Nov. 1923; Exp. Sta. Rec. 49. Aug. 1923)

F. oxysporum is a soil saprophyte capable of infecting potato under conditions favorable for that fungus, i. e., temperature above 18°C and medium to high soil moisture. The development of the disease after infection is accelerated by conditions unfavorable for the host. The potato is most sus-

ceptible during its early growth. Plants may be infected without showing any symptoms of the disease. In conditions of high temperature and low soil moisture the vascular system may be discolored in the absence of any organism. A constant low soil moisture is unfavorable for infection, but after plants have become infected a lowering of the soil moisture accelerates the wilt.

Infection usually takes place through the roots rather than through the seed pieces. Vascular discolorations of tuber or stem are not good diagnostic symptoms unless found in connection with a wilted plant.

Fusarium tuber rots caused by various species of Fusarium

The Fusarium rots of potato tubers occur generally over the country. These seem to be usually saprophytic following injury of some kind. The most frequent predisposing injury is bruising at the time of digging or handling. With reasonably dry storage or shipping conditions such tubers develop the dry type of Fusarium rot. The wet type of Fusarium rot seems to be more usual after freezing injury or sunscald, or in old potatoes shipped in the warm spring months. The dry type of rot was reported more extensively from Colorado, Idaho, and Minnesota, and the wet type from Florida, Alabama, Louisiana, Virginia, and Kentucky. The jelly-end type of rot was reported about as usual in Idaho, and more severe than usual in California.

The control of Fusarium rots presents a difficult problem because of the wholesale handling of the crop by machinery whereby bruising is so common and almost unavoidable. Potatoes which are mature bruise less easily than those which are dug green.

Stuart, in his book "The Potato" refers to Fusarium rots as follows: (1)

> "Species of Fusarium. -- Carpenter claims that *F. eumartii*, *F. radicicola*, *F. oxysporum*, *F. hyperoxysporum*, and *F. discolor* var. *sulfureum* have been clearly proven to be parasitic upon the potato tuber. In addition to these, it is known that *F. trichotheciodes* is responsible for heavy tuber losses, due to the 'powdery dry rot,' in western Nebraska and other western states where the conditions are favorable for its development. According to Carpenter, *F. eumartii* is a new stem-end and wound-invading dry rot of the potato tuber which annually causes serious damage in Pennsylvania. *F. radicicola* is a widely prevalent dry rot similar to *F. eumartii*. It is also responsible for the so-called 'jelly-end' rot of the tuber so common in the tule lands of San Joaquin and Sacramento River delta regions in California, as well as other irrigated sections in the Pacific northwest. It is commonly associated with *F. oxysporum* in this disease. *F. oxysporum* and *F. hyperoxysporum*, which have been commonly regarded as purely vascular tissue parasites, have been found by Carpenter to be capable of entirely destroying potato tubers. *F. discolor*, var. *sulfureum* occurs in hollow hearted potatoes, causing decay. The infected portion of the tuber turns a sulfur yellow. According to Carpenter, it has been isolated from decaying tubers from both North and South Dakota."

Recent literature

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Mosaic, cause unknown

The mosaic disease continues to be a serious trouble of potatoes. The distribution of and losses due to mosaic are indicated in the following table.

Table 23. Potato mosaic losses in 1922 and 1923.

State	Percentage loss		State	Percentage loss	
	1922	1923		1922	1923
N. H.	5	same	Ark.	10	10
Vt.	10	less	Ind.	.5	.5
Mass.	10	same	Wis.	trace	trace
Conn.	.5	less	Ill.	trace	trace
N. Y.	5	5	Minn.	1	1
Pa.	3.5	1.5	Mich.	3	2
N. J.	.5	less	Iowa	-	5
Del.		.25	Mo.	5	5
Md.	2	5	N. D.	trace	trace
Va.	1		Kans.	.5	trace
Ky.	4 spr.	10	Neb.	-	1
	15 fall	10	Utah	7	10
Tenn.	3	-	Ariz.	trace	trace
S. C.	trace	trace	Idaho	10	10
Miss.	10	-	Nev.	-	8
La.	25	15	Calif.	-	12
Tex.	trace	-			

The reduction in visible mosaic in 1923 is attributed to the high temperature during midsummer which masked the mosaic symptoms. Goss, of Nebraska, reports that mosaic was brought out early in the season by increased rainfall, low temperature and less sunlight. On the first field inspection mosaic was noted in 344 out of 346 fields, the percentage of diseased plants being 4.6%.

Folsom of Maine reports; "In the northeastern part of the state, about 30% of the hills had a degeneration disease, usually mosaic or spindle tuber."

Following the work of Schultz and others in determining that aphids are largely responsible for the spread of mosaic, Gilbert of Vermont reports a lack of these insects, and less mosaic in 1923. Rosa, of California, says:

> "The mosaic disease is rapidly becoming more serious due to the general presence of aphids in the spring of the year and to the failure of seed growers to perform their roguing early in the season. The latter operation has too generally been deferred until the crop was practically mature."

The Bliss Triumph variety continues to be most frequently mentioned as susceptible with Green Mountain a close second. The White Rose of California is also said to be highly susceptible. Hungerford, of Idaho, says the Netted Gem is more resistant than the Idaho Rural. According to Rosa the British Queen is highly resistant in California. Martin, of New Jersey, says mosaic is severe on American Giant and Green Mountain but not severe on Irish Cobbler. Temple and Jehle of Maryland report that the McCormick is their most susceptible variety.

The control of mosaic is being brought about by using certified disease free seed. This is especially important in the southern states where they can not grow their own seed.

Recent literature

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Doolittle, S. P. and H. H. McKinney. Intracellular bodies in the phloem tissue of certain plants and their bearing on the mosaic problem. Phytopath. 13: 326-329. pl. XV. July 1923. No. 7. Conclusion: the same as that of Kotila and Coons.

Hungerford, Chas. W., and J. M. Raeder. Mosaic and leaf roll of potatoes in Idaho. (Abstract) Phytopath. 14: 123. Feb. 1924.

Kotila, J. E. Mosaic and potato yields in Michigan. Quart. Bul. Agr. Exp. Sta. Mich. 5: 188-189. illus. May 1923. No. 4.

——————— & G. H. Coons. Trypanosome-like bodies in Solanaceous plants. Phytopath. 13: 324-325. July 1923. Conclusion: "The correlation of the trypanosome-like bodies with mosaic has not been proved and further investigations are necessary."

Leafroll, cause unknown

The leafroll disease in 1923 was reported as less prevalent than in 1922 in Vermont and Pennsylvania, about the same in New Hampshire, Connecticut, Minnesota, North Dakota, Utah and Idaho, and more in Massachusetts, New York, New Jersey, and Delaware. M. W. Gardner of Indiana says leafroll is the most serious potato disease in Indiana. Folsom of Maine, reports net necrosis giving leafroll in potato tests in the central part of the state.

The losses attributed to leafroll are New York, 7%; New Jersey, 6%; Pennsylvania 10%; Delaware, 2.5%; Indiana, 5%; Michigan, 5%; New Mexico, 2%; and Idaho, 3%. Owing to the difficulty of estimating losses from this type of disease, it is probable that the reduction in yield is more widespread than collaborators' reports would indicate. Chupp, of New York, reports the occurrence of leafroll in 87% of the 365 fields entered for potato certification this year.

The only dates of first appearance reported are June 11, Queens County, New York; July 7, Highwood, Connecticut; and August 1, Coconino County, Arizona.

There is no definite data regarding the influence of weather conditions. However, Chupp, of New York, thinks there is some connection because certain strains that were almost free in 1922 showed heavy increases in 1923.

The Irish Cobbler and American Giant are said to be especially susceptible in New Jersey, the late crop of Rurals in Indiana, the Russett Burbank in Utah, and the Netted Gem in Idaho.

The control of leafroll can best be brought about by using a seed plot and roguing the fields early and thoroughly. This is the opinion of collaborators in New York, New Jersey, Pennsylvania, Delaware, Ohio, and Michigan.

Recent literature:

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Murphy, P. A. Investigations on the leafroll and mosaic diseases of the potato. Jour. Dept. Agr. & Tech. Inst. Ireland 23: 20-34. May 1923.

__________ On the cause of rolling in potato foliage; and on some further insect carriers of the leafroll disease. Sci. Proc. Roy. Dublin Soc. 17: 163-184. 1923.

Potato tipburn, cause non-parasitic, and hopperburn induced by leaf hopper (Empoasca mali LeB.)

Hopperburn and tipburn are not distinguished in the collaborators' reports. In the seventeen states where there are comparative data available it is seen that, with the exception of New York, Maryland, Kentucky, and Alabama, this disease was much less prevalent in 1923 than in the previous season of 1922. This point is brought out in the accompanying graphic representation fig. Estimates of losses were received from the states of Massachusetts, Connecticut, New Jersey, Missouri, and Mississippi in 1922 but no estimates were received in 1923, so it is assumed that the disease was of very minor importance. Tipburn is conspicuous by its absence in reports from the Rocky Mountain and Pacific Coast sections.

The appearance of tipburn occurred noticeably later in the season in 1923 than in 1922, as indicated in the following table.

Table 24. Dates of earliest appearance of tipburn in 1922 and 1923.

Date of appearance		State	Date of appearance		State
1922	1923		1922	1923	
April		La.	June	July 30	S. D.
May 16		Miss.	July 1	June 25	N. J.
May		Okla.		July 18	Ill.
June 3	July 3	Minn.	Aug. 2	July 27	Ohio
	June 5	N. C.	July 10		Vt.
	June 9	N. Y.	July 29		Conn.
June 16		Del.		July 30	W. Va.
June 28	July 25	Wis.			

The cold backward weather in April, May and early June is considered by Kotila (Michigan) to be the explanation of the late arrival of leafhopper

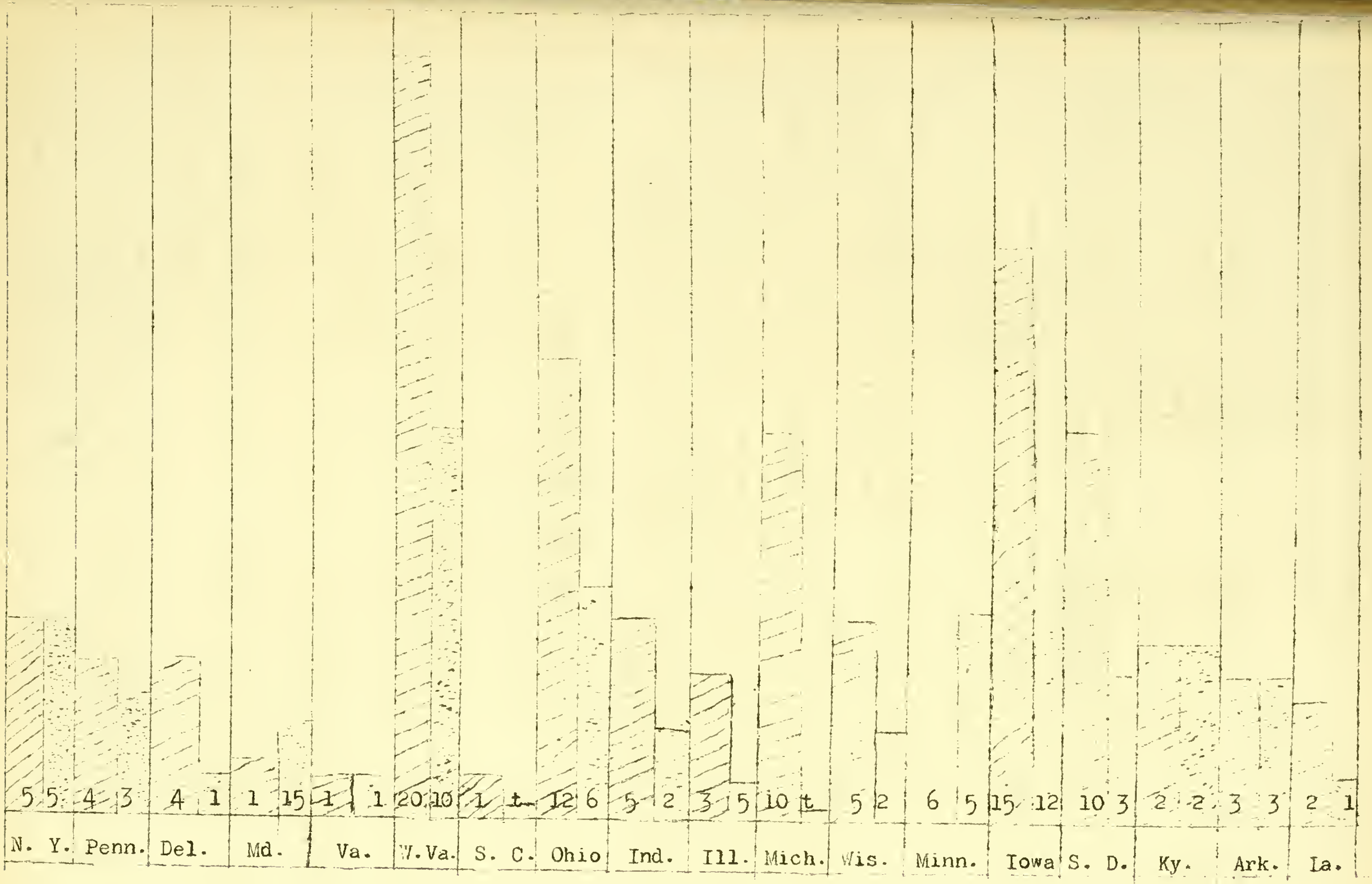

Fig. 5. Relative Percentage Loss from Potato Tipburn and Hopperburn

1922-1923.

▨ =1922 ⬚ =1923

in potato fields. This judgment is concurred in by members of the Bureau of Entomology, United States Department of Agriculture.

The control of hopperburn by the use of Bordeaux mixture was not as striking in 1923 as in seasons when the hoppers have been more prevalent. However, thorough spraying with properly made Bordeaux mixture continues to be the best control measure for the trouble.

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Lutman, B. F. An outbreak of hopperburn in Vermont. Phytopath. 13: 237-241. 1923.

Parks, T. H. and E. E. Clayton. Potato hopperburn (tipburn) control with Bordeaux mixture. Ohio Agr. Exp. Sta. Bul. 368: 243-258. June 1923.

Triumph most susceptible, Irish Cobbler least susceptible of early varieties. None of the late varieties were found to be immune to hopper burn. Members of the Green Mountain group seemed to resist the leafhopper better than members of the Rural group. The Bordeaux formula recommended for Ohio conditions was 5 pounds copper sulfate and 7 1/2 pounds lime to 50 gals. water. The average increase from 60 field tests was 31.6 bushels per acre. Spray was applied 4 or 5 times. Potato News Bul. 1: 63. No. 4. Feb. 1924.

Perret, Claude. La dégénérescence des pommes de terre. Le role de l'inspection aux champs. Vie Agr. et Rur. 23: 61-66. July 28, 1923. (Abst. in Rev. Appl. Myc. 2: 568. Dec. 1923). The author uses the iodine water test to distinguish leafroll from similar symptoms induced by Rhizoctonia, blackleg, basal injuries, premature drying and other causes. The operation of this test is as follows: "The leaves of suspected plants should be gathered in the early morning, boiled in Eau de Javelle, rinsed in ordinary water, dipped into water containing a few drops of iodine and rinsed again. The leaves of diseased plants show a dark brown discoloration owing to the accumulation of starch. Leaves detached in the evening and placed overnight with the petioles in water retain their starch if diseased and lose it if healthy."

Other degeneration diseases

Curly dwarf, cause unknown, is considered by many to be a stage or symptom of mosaic. The plants are dwarfed in appearance and the yield is said to parallel infected plants. Weber reports a 2 per cent loss in Florida. Thomas, of Ohio says curly dwarf is not important where certified seed is used.

Spindle sprout, cause unknown, is a disease of minor importance. It was reported from Kentucky, North Dakota, South Dakota, Nevada, Idaho, and California. A disease of apparently similar nature but of slightly different type was reported from Idaho.

Spindle tuber, a disease the cause of which is unknown, is considered by Schultz and Folsom (1) to be the result of infectious disease. It has been transmitted from affected to healthy plants by means of tuber and haulm grafts, leaf mutilation inoculation, and plant lice. In the above respects it resembles the mosaic disease. Plants infected late in the season may not show any symptoms, while those infected early have more cylindrical, spindling and spindle shaped tubers than healthy plants. The eyes of the tubers are numerous and more conspicuous than usual. The yield is somewhat reduced in the first year and there is a progressive decreased production in later years from plants grown from spindle tubers. The control of the disease seems to lie in field and hill selection and the use of certified seed.

Spindle tuber was reported in 1923 from Maine, Vermont, New York, New Jersey, Ohio, Kentucky, South Dakota, and Nebraska. Chupp, of New York, states that, "spindle tuber or marginal leaf roll has been found quite prevalent in many potato sections. No doubt it has often been mistaken for leaf roll or even mosaic in previous years." Martin, of New Jersey, and Evans of South Dakota say it is common in the Irish Cobbler variety.

Degeneration diseases not distinguished as to type were considered by Gardner of Kentucky and Miss Detmers of Ohio to be about the same as in 1922. They occur generally wherever potatoes are grown and in some cases every plant in a field will show breaking down with consequent loss of crop. Roguing out diseased plants in the field and selection of seed are given as the only control measures suitable to the type of troubles in which are evidently phases of leafroll or mosaic. Folsom of Maine reports: "Reduction in gross yield from degeneration diseases probably was 30%."

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Schultz, E. S. and Donald Folsom. Transmission, variation, and control of certain degeneration diseases of Irish potatoes. Jour. Agr. Res. 25: 43-117. July 14, 1923.

Wart caused by Synchitrium endobioticum (Schilb.) Perc.

Potato wart was not discovered in any new location during 1923. Investigational work was continued by the United States Bureau of Plant Industry, cooperating with the State College of Agriculture and State Department of Agriculture of Pennsylvania. Quarantine regulations were kept in force as regards intrastate, interstate and international commerce.

Dr. Freeman Weiss has submitted the following statement for inclusion in this summary:

> "No further survey for wart was made, except in the agricultural section, largely devoted to potato culture, which surrounds the area under quarantine at Freeland, Pa. No infection was found there, but only about one third of the potatoes planted were of susceptible varieties. Within the quarantined area all wart-susceptible varieties were rogued out early in the season, so that during the period of maximum infection nothing but immune potatoes were to be found in the entire area, with the exception only of the experimental gardens of the State and Federal Authorities. In these wart appeared earlier in the season than ever before noted -- June 23 on potatoes planted May 12 -- and its development was favored by the cool season. In July and August there were drought periods of 2 to 3 weeks duration. The mean growing-season temperature was 2.2° below the 10 year normal. Infection on tomatoes was more general than in previous years since 1920.
>
> "The variety Russet Burbank has been added to the list of those immune to wart -- a fortunate circumstance, since this variety combines high resistance to scab and immunity to wart."

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Miscellaneous parasitic potato diseases

Bacterial soft rot, otherwise known as slimy soft rot, was a serious trouble in early potatoes shipped from the southern states. Miles, of Alabama, estimates a 10 per cent loss in every car shipped to northern markets. It was frequently associated with the wet type of Fusarium rot.

Potato brown rot due to Bacterium solanacearum EFS. was reported as serious in half the fields of Florida. Weber states that "a twenty acre field near Federal Point showed 40% infection, with a 10% reduction in yield. Another 60 acre field near Hastings showed 12-15% reduction in yield. The total loss to Florida would probably be 3-5%." It was also reported as present in the southeastern part of Maryland.

Silver scurf caused by Spondylocladium atrovirens Harz. was reported as a very minor trouble in Maine, Connecticut, New York, Florida, Idaho and Washington.

Wilt caused by Verticillium alboatrum Reinke and Berth. was reported for the first time in Connecticut where at least 10% of the vines were killed prematurely in several fields. It occurred chiefly on Spaulding Rose in the vicinity of Middletown. It was also reported in New York and Maine. Chupp, of New York, states that only isolation of the fungus can differentiate between Fusarium and Verticillium wilts.

Southern blight caused by Sclerotium rolfsii Sacc. was evidently common in Florida, Alabama, Louisiana, and Texas. It caused losses varying from a trace to 30 per cent in the field and was also found during transportation.

Yellow dwarf, cause undetermined, was evidently less important than the previous season. Martin reports one plant found in a 20 acre field in Monmouth County, New Jersey. Weber reports a few affected plants found near Hastings, Florida. This is the first report of its occurrence in Florida. The source of the seed was doubtful. Chupp says that this is the most menacing disease of potatoes in New York, where it is found mostly in the Mohawk Valley. The loss to the crop is estimated at .5 to 1%. In 1922 it was reported from Vermont, New Jersey, Pennsylvania, and New York.

Root-knot caused by nematode, Heterodera radicicola (Greef) Müll. was reported in one case in Alabama where 10% of the tubers were affected. The vines were also dwarfed. It was noted as prevalent in Texas causing a 1% reduction in yield. Stokdyk and White report the first finding of root knot on potato in Kansas. It was found attacking an old seed piece at Kansas City August 9, 1923. The root-knot was also found on roots and young stalks in the greenhouse at Manhattan. The greatest damage in the country is reported from California where Milbrath says the root-knot is general causing a loss of 8%.

Other parasitic troubles reported were leak caused by Pythium debaryanum Hesse, Connecticut (in storage), Mississippi (spring crop), Idaho and Washington (mid-season crop), and California (delta region); powdery scab caused by Spongospora subterranea (Wallr.) Johnson, Connecticut; purple tuber rot caused by Rhizoctonia crocorum DC., New York (Cortland County, first specimens ever received at the laboratory - Chupp); yellow wilt caused by Sclerotinia libertiana Fckl., New York and Florida; Armillaria root rot caused by Armillaria mellea (Fr.) Quelet, Michigan; anthracnose caused by Colletotrichum atramentarium (Berk. & Br.) Taub., Florida, Ohio.

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Inoculation experiments established the separate identity of skin spot and powdery scab.

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Skin spot is a primary stage in the development of powdery scab and not a separate disease due to Oospora pustulans, Colletotrichum atramentarium, or a Phoma sp. These fungi are undoubtedly secondary invaders.

Miscellaneous non-parasitic diseases

Blackheart was reported in Connecticut, New York, Michigan, Wisconsin, Washington, and California. In no case was it a major trouble but was found largely in seed stock that was shipped in overheated cars or stored in too deep and air tight pits or bins where a lack of oxygen developed.

Stem-end browning was reported by Folsom, of Maine, as generally attributed to climatic conditions, as it could not be correlated with organisms or leaf roll.

Fertilizer injury. Martin, of New Jersey, reports that in plots where all the nitrogen was derived from inorganic material the plants were green on

July 27, while those that received half the nitrogen from organic sources were dead. In a triangle experiment the plots receiving increased amounts of nitrogen were green on the above date, while those receiving larger amounts of potash and phosphoric acid were dead.

Missing hills, brought about by a variety of causes such as poor planters, poor seed, poor climate, poor farmers, and poorly tilled soil, are said by Chupp of New York to reduce the yield in that state by about 5%.

Frost injury. Frost did little damage to the potato crop in 1923. The early crop from Florida was delayed about 3 weeks by a severe frost of February 19. Some of the plants failed to sprout a second time. The Georgia crop was checked by a frost March 19. In Minnesota a frost August 1 injured the late crop 1% in the northern counties. The heavy frost of September 13 did considerable damage in Wisconsin and Michigan. This was especially true where the crop was late in development because of its being checked by the summer heat and drought.

Dry weather which caused premature dying cut down the yield of early potatoes in New Hampshire and Connecticut and probably also in other eastern and central states. Less drought trouble than usual was reported from Idaho. McCubbin, of Pennsylvania, makes the following observation:

> "Seed potatoes which sprout blindly into small tubers, or in which the eyes develop small clusters of tubers instead of normal sprouts have been observed. It is suggested that this may be due to the devitalizing effect of the hot weather of 1922."

Excessive moisture was held responsible for some cases of poor germination to potatoes on low ground in Florida. (A. C. Foster)

Other non-parasitic troubles reported were hollow heart, Connecticut, Wisconsin, Washington; internal brown spot, Washington; brown streak, California (seems to be associated with an unusually dry season and improper cultural conditions; loss 5% - Milbrath); surface breakdown, Michigan (very common in storage; probably due to lack of oxygen - Kotila); spray injury, Mississippi; lightning injury, New York, Michigan, Wisconsin; enlarged lenticels, and chlorosis, Washington.

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DISEASES OF TOMATO

Leaf spot caused by Septoria lycopersici Speg.

Leaf spot caused by Septoria lycopersici Speg. is one of the major diseases of tomato in the Middle Atlantic and North Central states. It has not been reported from the Pacific Coast. During 1923 leaf spot was reported less severe than usual in Connecticut, New York, New Jersey, Maryland, Florida and

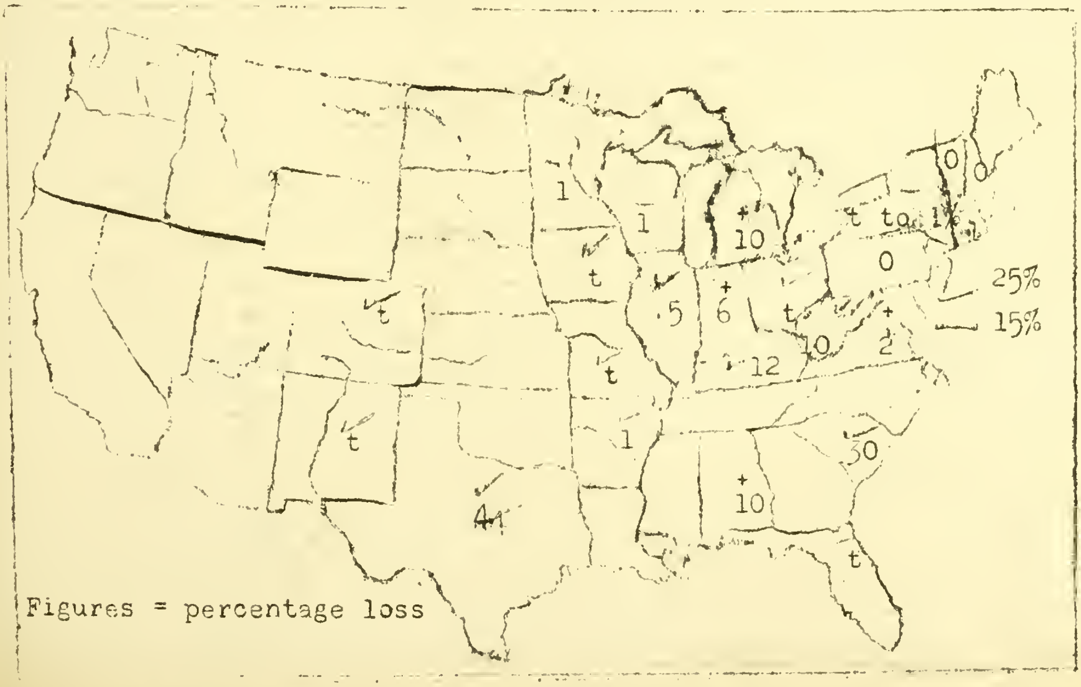

Fig. 6. Relative prevalence and losses from Septoria leaf spot, 1923

Wisconsin. Practically the same losses as usual occurred in West Virginia, Kentucky, South Carolina, Arkansas, Illinois. North Dakota, Minnesota, Iowa, Missouri, Kansas, Colorado, and New Mexico. It was more severe than usual in Delaware, Virginia, Ohio, Indiana, and Michigan.

The spread of leaf spot seemed to be held in check in many places by the drought of midsummer and only came on in epidemic form following the late summer and early fall rains. The greatest amount of leaf spot occurred when the crop was in full development or near maturity. The disease causes a dropping of leaves and consequent dwarfing and possible scalding of fruit.

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Hall, H. F. More tomatoes from the same acreage. Canner 56 (10): 122-123. Mar. 3, 1923.

Bordeaux fish-oil soap 4-4-1 1/2-50 has given best control of leaf spot on farms of Joseph Campbell Co., Camden, N. J.

Wilt caused by Fusarium lycopersici Sacc.

This disease caused widespread losses in 1923. Collaborators report wilt as more severe than usual in New Jersey, Delaware, Virginia, Illinois, Michigan, Iowa, Utah, and New Mexico. It was about the same as usual in Maryland, South Carolina, Mississippi, Louisiana, Texas, Arkansas, Missouri, Kansas and Ohio, and less than usual in Kentucky, Indiana, Wisconsin, North

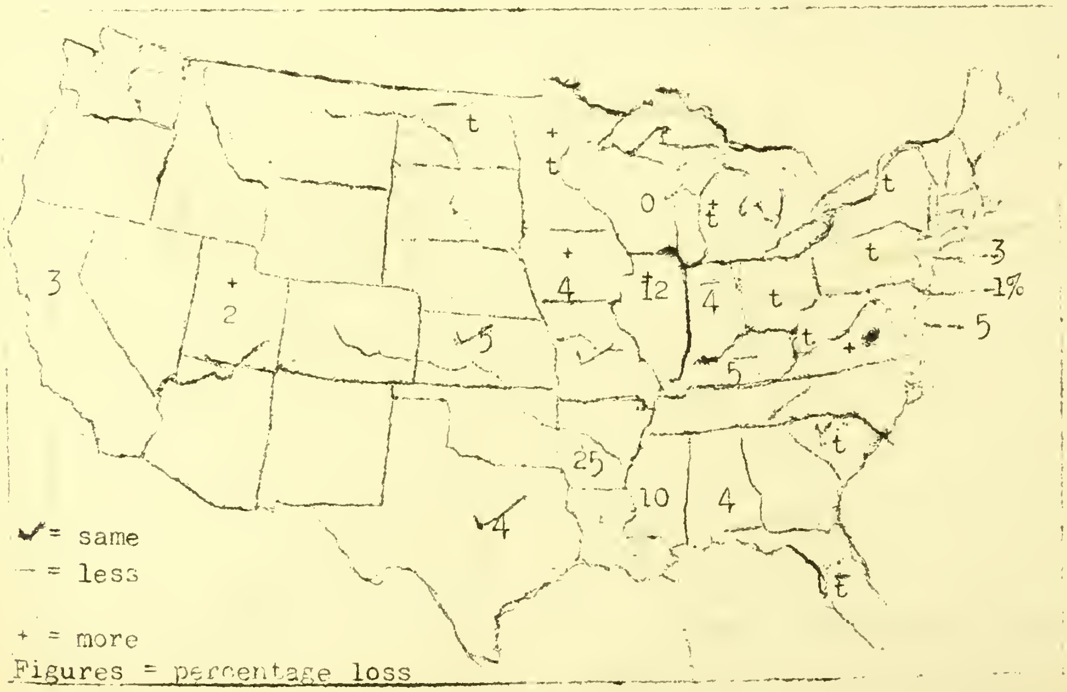

Fig. 7. Relative prevalence of and losses from Fusarium wilt in 1923

Dakota, and California. This disease is not so widespread as the leaf spot.

Wilt in Utah assumed serious proportions this year and Richards states that the future of the canning industry is endangered unless resistant varieties can be found. The estimated losses are entered on the accompanying map. Coons reports from Michigan that wilt was widely distributed around Grand Rapids by using plants started in infected soil in greenhouses or by bringing in infected plants from Indiana or the South. Indiana is said to have imported 18,000,000 plants from the South.

What was said to be the first authentic record of the occurrence of wilt in Minnesota was received in 1923. It caused moderate losses in a few fields of Hennepin County.

The hot, dry weather is considered by Martin, of New Jersey, to be the leading factor in causing the serious outbreak of wilt.

Table 25. Dates of first appearance of Fusarium wilt in 1923.

Date	Place	Date	Place
May	Davis, Calif.	June 16	Chanute, Kans.
May	Baton Rouge, La.	June 25	Peoria, Ill.
May 4	Tiffin, Ohio	July 15	Newark, Del.
May 24	Copiah Co., Miss.	Aug. 12	Layton, Utah
June 1	Yavapai Co., Ariz.	Aug. 23	Long Island, N. Y.
June 11	Hardville, S. C.		

Disease resistant varieties are coming into more general use in Louisiana and, according to Edgerton, are responsible for preventing greater losses from this cause. Gardner, of Kentucky, reports the Marvel 90% resistant, and the Norton 80% resistant under their conditions. Resistant varieties are also reported as satisfactory in Mississippi, Arkansas, and Kansas. Martin, of New Jersey, reports the Greater Baltimore variety as very susceptible. There seems to be no other method of control which gives any promise of success.

Recent literature

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Shapovalov, M. and J. W. Lesley. The behavior of certain varieties of tomato to the wilt disease (Fusarium) in California (Abstract) Phytopath. 14: 121. Feb. 1924.

White, R. P. Tomato wilt. (Abstract) Phytopath. 14: 28. Jan. 1924.

Early blight caused by Alternaria solani (E. & M.) J. & G.

This disease is largely a southern disease and does relatively little damage in the Atlantic or central sections. One county in Florida is reported by Weber to have lost $100,000 from this cause. It was more serious than usual in Florida, Alabama, Mississippi, Louisiana, Indiana, Illinois, and Iowa. In New York, New Jersey and Maryland the infection occurred largely on the leaves, in Florida and Mississippi the fruit spot and rot was most serious, while in Indiana the collar rot which came from seed bed infection caused the greatest damage. In sections where early blight occurs it is reported as general rather than confined to scattered areas.

Table 26. Dates of first appearance of tomato early blight, 1923.

Date	Place	Date	Place
Jan. 1	Key West, Fla.	June 29	Baton Rouge, La.
Apr. 4	Copiah, Miss.	July 31	Seaford, Del.
June 3	Cortland, N. Y.	July 25	Illinois
June 7	Burlington Co., N. J.	Aug. 3	Storrs, Conn.
June 25	Grant Co., Ind.	Aug. 15	Fargo, N. D.

The prevalence of tomato early blight seems to be closely associated with the rainfall during the growing season. The rains came so late in New York and New Jersey that little damage was caused.

There have been no reports regarding disease resistance or susceptibility with reference to early blight. The only control measure that has given satisfaction is the use of properly made and applied Bordeaux mixture. Spraying has not been generally practiced, which may account for the extensive losses.

Recent literature

Pritchard, F. J. Tomato diseases and how to overcome them. The Canner 56 (10): 124-125. Mar. 3, 1923.

Leaf mold caused by Cladosporium fulvum Cke.

Leaf mold was widespread as a greenhouse disease in 1923. It was reported in the fields in the canning sections of Kentucky as causing an unusually heavy damage which was followed by the leaf spot disease. The rainfall during July and August was more than usual. White, of Kansas, reports seeing the disease in the fields for the first time. Cook and Toro reported leaf mold as severe in Porto Rico.

The control of leaf mold is usually brought about by reducing the humidity by attention to ventilation. Chupp, of New York, reports one man who used an electric fan to force ventilation. Gardner, of Indiana, says one man sprayed his greenhouse in the fall with lime sulphur with fair success.

Blossom end rot, non-parasitic

Blossom end rot is one of the widespread diseases of tomato. It is reported from the Atlantic to the Pacific coast. Reports from collaborators in 1923 show it was more than usually prevalent in Connecticut, New Jersey, Delaware, and Mississippi; about the same as usual in Ohio, Illinois, North Dakota, Washington, and California; and less than usual in Louisiana, Minnesota, Wisconsin, Iowa, and Idaho. Poole, of New Jersey, says blossom end rot was worse in 1923 than for the past four years, occurring in both greenhouses and fields.

Table 27. Blossom end rot losses and dates of first appearance.

State	Percent loss	Date of first appearance	State	Percent loss	Date of first appearance
Vt.	t	October 8	Ohio	same	
Conn.	more	August 12	Ind.	t	
N. J.	3		Ill.	1	June 29
Pa.	1		Mich.	t	
Del.	more	July 25	Wis.	t	
W. Va.	2		Iowa	t	
N. C.	15		Mo.	5	
Ala.	5		N. D.	t	July 30
Miss.	10	May 25	Kans.	2	
La.	t	June	Ariz.	minor	July 1
Tex.	1		Idaho	less	
Ark.	1		Wash.	same	
			Calif.	same	

There is considerable difference in varieties as to susceptibility to blossom end rot. Gilbert, of Vermont, says Bonney Best is very susceptible. Nixon, of Pennsylvania, says there are strains of Stone that are very susceptible, while Brown of Arizona says that Stone and Earliana showed no disease while other unnamed varieties showed the disease. Milbrath, of California, says blossom end rot is very severe on the Earliana variety. He also says there is more trouble with the early set fruit than with the late crop. Adams, of Delaware, and White, of Kansas, also report a greater amount of end rot on early set fruit.

The conditions under which the plants are grown seem to determine the amount of blossom end rot. White, of Kansas, says the soil and air temperatures are as important as the soil moisture. Chupp, of New York, reports as follows:

> "Dr. L. M. Massey found that in one greenhouse at Irondequoit, Monroe County, 25% of the fruit on 50% of the 1000 plants were badly affected with blossom end rot. The grower had luttuce planted with the tomatoes so kept the soil as dry as possible. After the lattuce was harvested, he began watering heavily with the result that within a week the disease began to appear. The fruit was about one-half mature."

Bacterial wilt caused by Bacterium solanacearum EFS.

This disease was reported in 1923 from seven states and Porto Rico. It was especially serious in Florida, Mississippi, and Louisiana. Edgerton says that it has caused the most damage (5%) for many years in Louisiana. He attributes the greater amount of bacterial wilt to the very wet weather. There are no observations on disease resistance or any methods of control.

Mosaic, cause unknown

Mosaic, cause unknown, is usually considered a minor disease although in some cases it may assume serious proportions. Young and Thomas of Ohio say that mosaic is second in importance only to wilt and is causing much loss in both field and greenhouse cultures. Mosaic was reported by collaborators as more prevalent than usual in Delaware, Maryland, Ohio, Iowa, Nebraska, Kansas, Utah and Idaho. It usually occurs scattered in a field. Adams, of Delaware, says:

> "This disease was the most limiting factor in seed bed production. Closely related wild plants are carriers. Methods of cultivation have indicated a relation to rapid distribution in the field."

Gardner, of Indiana, thinks tomato mosaic is retarded by low temperature. Martin, of New Jersey, found more mosaic on light soil and high ground than on heavier soil.

Mosaic has been reported on the following varieties: Teuton, Bonney Best - very bad; Acme, Earliana and Greater Baltimore - medium. White, of Kansas, observed no varietal resistance.

Literature

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Kofoid, C. A., H. H. P. Severin, and O. Swezy. Nelson's spiral bodies in tomato mosaic not protozoans. Phytopath. 12: 330-331. July 1923.

Root knot caused by nematode, Heterodera radicicila (Greef) Müll.

In the canning sections this trouble is not reported in fields. Reports of nematode trouble in greenhouses from New Jersey, New York, and Ohio. Field losses from nematode occur in South Carolina, 10%, California, 10%, Alabama, 2%, New Mexico, 2%, Texas, 1%, and Arizona. In the South it may be associated with the wilt disease. Moore, of South Carolina, says it is becoming more serious throughout the state. Steam sterilization of greenhouse soil is the most satisfactory method of control, where it can be employed.

Malloch (1) gives a list of 98 varieties and 8 controlled hybrids of tomato that have been found by him to be susceptible to root knot. He believes that there are no physiological or biological races of the nematode, one form attacking all hosts.

Literature cited

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Other diseases

Late blight caused by *Phytophthora infestans* (Mont.) DeBary. There was an unusually small amount of this disease in 1923. A few specimens were reported from New York, West Virginia, and California. Negative reports were received from Virginia and Ohio.

Buckeye rot caused by *Phytophthora terrestris* Sherb. was reported by Berg of West Virginia. Although this is the first report from that state, Berg states it was first noted in their pathological garden in 1917. The fungus closely resembles the lemon fungus Phythiacystis. Kendrick, of Indiana, reports buckeye rot in a few greenhouses. Weber, of Florida, says buckeye rot is considered one of the destructive tomato diseases, ranking next to early blight in importance. A 5% loss resulted from this disease. A 90 acre field near Homestead showed 50-70% loss.

A new Phytophthora isolated in 1917 from tomato fruit shipped from Mexico to Seattle, Washington, has been described by Hotson and Hartge (4) as *P. mexicana*. The organism causes a black wilt when inoculated into plants, and a destructive rot of fruits infected.

Phoma fruit rot caused by *Phoma destructiva* Plowr. (2) was of minor importance in 1923 except in Iowa where Melhus reports it doing considerable damage, and in Ohio where Young says it was very destructive, especially in the southern and central part of the state. It was also reported in the fields from New York, Florida, and Alabama. Heald and Dana, of Washington, found it on fruit sent in from Mexico and Mississippi.

Anthracnose caused by *Colletotrichum phomoides* (Sacc.) Chester was of minor importance in 1923 with the exception of New Jersey, where Poole says: "The disease was reported August 23 on Bonny Best. It was very destructive during September causing heavy loss in many fields." It was reported also from Indiana, Washington (on fruit sent in from Mississippi), and Florida (loss negligible).

Bacterial spot caused by *Bacterium vesicatorium* Doidge (3). This disease was reported by Gardner, of Indiana, as causing more loss than usual, although still of minor importance. He attributes the increase to the use of untreated seed and southern grown plants. It was also reported from Kansas and Missouri. An undetermined bacterial spot was reported by Clayton, of New York, (Long Island).

Soft rot caused by *Oidium lactis* Fresen. or *Oospora lactis* (Fresen.) Sacc. was reported from New Jersey as serious following growth cracks. It was worse during damp, rainy weather. Pritchard and Porte (6) have described a watery rot of tomato fruits due to a physiological form of *Oospora lactis*, indistinguishable morphologically from the parent species, to which they apply the trinomial *O. lactis parasitica*. It has been common since the spring of 1921 in tomatoes shipped from the Gulf States, and is prevalent in the vicinity of Arlington, Virginia, and the District of Columbia.

Olpidium brassicae (Wor.) Dangeard was found in the roots of tomato plants in a greenhouse at the University of Wisconsin (1). It has not been reported previously in this country.

Western yellow blight, cause uncertain. This has variously been ascribed to bacteria, Fusarium, Rhizoctonia, and by Heald, of Washington, to a virus. It seems to be the result of unfavorable environment with the organism, if any, a secondary matter. Shapovalov states that distribution and prevalence depend on climatic conditions; and thinks that "it is probable physiological collapse of the small rootlets precedes the fungus infection". (7) It was much less prevalent in 1923 than in previous years. It was reported from Arizona, California, Washington, and Idaho.

Winter blight, *stripe*, or *streak*, cause undetermined (5,8) was reported as rather common in New York and New Jersey. More streak was found in greenhouses than fields and it was often associated with mosaic.

Puffing is said by Milbrath to be very abundant in California affecting 20% of the fruit. Taubenhaus reports puffing as prevalent in Texas where the Detroit variety is very susceptible.

Other diseases reported were *canker* caused by *Phytophthora* sp. (Reddick's species), New York (two fields near Ithaca); *damping-off* caused by *Pythium* sp., Florida; *damping-off* caused by *Rhizoctonia* sp., Mississippi, Illinois; *southern wilt* caused by *Sclerotium rolfsii* Sacc., Florida, Alabama, Mississippi, Louisiana, Texas; *root rot* caused by *Ozonium omnivorum* Shear, Arizona; *watery soft rot* caused by *Sclerotinia libertiana* Fckl., Florida (doing minor damage to large spreading vines with dense foliage); *soft rot* caused by *Bacillus carotovorus* Jones, New Jersey (serious following hail injury); *soft rot* caused by *Rhizopus* spp., New Jersey, Florida, California; *soil rot* caused by *Rhizoctonia* sp., Indiana; *leafspot* caused by *Gloeosporium phyllachoroides* Ell. & Ev., Florida; *leafroll*, cause uncertain, New York; *collar blight*, cause undetermined, Delaware (considerable damage locally in New Castle County); *wilt* caused by undetermined bacteria, Ohio (5% of plants infected in one greenhouse); *hollow stem*, cause unknown, Arkansas (attributed to too much nitrogen in the fertilizer); *blossom drop*, cause unknown, Ohio, Texas; *sun scald*, New York, Wisconsin, Washington; *frost injury*, Georgia, Florida, Texas, California; *hail injury*, Kansas (several fields severely injured by a hail storm August 23; some fields a total loss and many running as high as 80%).

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DISEASES OF SWEET POTATO

Stem rot and wilt caused by Fusarium batatatis Woll. and F. hyperoxysporum Woll.

This disease is widely prevalent in the sweet potato growing sections of the country. It is reported as the limiting factor in sweet potato culture in New Jersey, Delaware, Iowa, Missouri, and Kansas. It was exceptionally scarce in Florida in 1923 and of only local importance in Georgia, Alabama, and Mississippi. Plants show symptoms of the disease in both plantbed and field.

Table 28. Losses caused by wilt, 1923.

State	Loss percent	State	Loss percent
New Jersey	30	Alabama	1
Kansas	15	Mississippi	t
Delaware	8	Georgia	present
Iowa	7	Florida	very scarce
Missouri	5	Ohio	present
Maryland	4	Indiana	present
Arkansas	2	California	10% on susceptible varieties.

The dry, hot weather of June is considered by Martin, of New Jersey, to be a leading contributing factor in the prevalence of wilt.

The control of wilt has largely been effected in Mississippi, (Neal) by maintaining a state inspection of plants, strict quarantine over shipment of plants and general plant sanitation. The use of select resistant strains is also a promising way in which wilt is controlled. Martin, of New Jersey, says there are now in limited use resistant strains of Big Stem Jersey, Triumph, Dahomey, Red Brazil, and White Yam. The Triumph is also reported as resistant to wilt in Alabama and California. The Porto Rico is another resistant variety of California. The Little Stem Jersey is said to be very susceptible in Delaware.

A sweet potato variety demonstration was held by J. F. Adams in Delaware with the following results:

Table 29. Comparison of susceptibility of sweet potato varieties to wilt in Delaware.

Strain selected	Percentage of wilt	Strain selected	Percentage of wilt
Triumph	1	Little Stem	6
Big Stem	2	Early Carolina	6
Nancy Hall	3.5	Southern Queen	7
Porto Rico	5	Check (Big Stem)	35

The sprouts for the test were supplied by L. L. Harter, Bureau of Plant Industry.

Black rot caused by Sphaeronema fimbriatum (E. & H.) Saco.

Black rot did not cause extensive losses in 1923 with the exception of Texas, where a loss of 10% was reported. It was generally distributed throughout the sweet potato growing regions.

Table 30. Black rot losses in 1923.

State	Percentage loss	State	Percentage loss
Texas	10	South Carolina	.5
Iowa	5	Illinois	.5
New Mexico	5	Florida	t
Alabama	2	Missouri	t
Mississippi	2	Kansas	t
Arkansas	2	Kentucky	general
New Jersey	2	California	general
Maryland	1		
Delaware	.5		

The control of black rot is being accomplished by the quite general use of seed treatment and certified slips. The use of such seed is mentioned by collaborators in Delaware, Mississippi, Arkansas, Missouri, Kansas, and New Mexico. Growers failing to treat their seed frequently lost heavily, one in Alabama reporting 40% loss. The results of the use of sulfur for the control of black rot and soft rot are reported by Adams of Delaware as follows:

Table 31. Results of treating soil with sulfur for sweet potato disease control.

	Percentage sound		Percentage black rot		Percentage soft rot	
	1st	2nd	1st	2nd	1st	2nd
Treated	62.3	83.8	27.4	6.3	10.6	9.8
Untreated	24.8	37.1	65.9	56.2	9.2	6.6

Soft rot caused by Rhizopus nigricans Ehr.

The storage disease has caused less loss than usual except in Alabama, Texas, and Arkansas, where losses of 10%, 20% and 25% respectively are reported. It was less serious than usual in New Jersey and Delaware. The losses as a rule came as a result of poor storage conditions in banks, and in uncured potatoes and those injured by grubs or wire worms. The disease was reported from New Jersey, Delaware, Florida, Alabama, Mississippi, Texas, Iowa, Missouri, Kansas, and Arkansas.

Recent literature

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Scurf caused by Monilochaetes infuscans Hals.

The following losses were reported as due to scurf (soil stain) - 3%, New Jersey; 2%, Kansas; 1%, Alabama; 0.5%, Maryland; trace, Delaware, Kentucky, North Carolina, South Carolina, Florida, Mississippi, and California. The disease is widespread in the main sweet potato sections and seems to be especially severe where heavy applications of stable manure are used, and in sections where there is heavy rainfall during the setting period.

Poole, of New Jersey, reports good control from the use of sulfur broadcast at the rate of 300 pounds per acre. Adams, of Delaware, found 12% decrease in scurf where 150 pounds of inoculated sulfur was used per acre, and there was also an increase in yield of 62 baskets per acre.

Scurf occurs on all varieties of sweet potatoes, although Miles says that it was "apparently worse on Porto Rico than on Triumph," in Alabama.

Other diseases and injuries

White rust caused by Albugo ipomoeae-panduranae (Schw.) Swingle was common and widespread in 1923, but the actual damage was very slight. The amount of rust was increased where there were rains during the growing season. It was noted in New Jersey, Delaware, Florida, Alabama, Mississippi, Arkansas, and Porto Rico. Adams, of Delaware, made the following observations on varietal susceptibility:

> "The disease was prevalent on Big Stem, Little Stem, and Early Carolina. There was a trace on Triumph. No infections were observed on Nancy Hall, Southern Queen, or Porto Rico."

Pox or soil rot caused by Cystospora batata Elliott was more than usually prevalent in New Jersey, causing a loss estimated at 5%. Poole says he first saw symptoms of pox June 27 and thinks its development was favored by the dry weather. Tests with inoculated sulfur were partially successful and also increased the yield 10%. Pox is said to have caused a loss of 2% in Kansas, 1% in Texas and 0.5% in Maryland. Stokdyk, of Kansas, thinks the reduction in loss is due to the more general use of seed treatment. The results will, of course, be influenced by the amount of soil infection, soil type, and reaction.

Charcoal rot caused by Sclerotium bataticola Taub. was reported as of minor importance in New Jersey, South Carolina, and Texas, but very prevalent in Florida where Weber states it caused a loss of 2-4%, one of the important diseases of sweet potatoes in storage.

Java black rot caused by Diplodia tubericola (Ell. & Ev.) Taub. was reported from North Carolina, South Carolina, Florida, Alabama, and Texas. Stokdyk, reported it on seed shipped into Kansas from the South. The losses are estimated at 5-10% of stored crop in Florida, and 1.5% in Alabama, traces in the other states.

Leaf spot caused by Cercospora batatae Zimm. was present in Florida wherever sweet potatoes were grown. Weber states: "In most fields the plants were 100% infected but in no case was the disease observed to be of a serious nature."

Southern blight, caused by Sclerotium rolfsii Sacc. was reported by collaborators in New Jersey, South Carolina, Florida, Alabama, and Mississippi. Poole, of New Jersey says it is the first time they have noted it in the state. The losses were considerable in some instances, but resulted in no reduction of yield.

Damping-off caused by Sclerotinia sp. was reported from New Jersey, (see Pl. Dis. Reporter 7: 13. June 15, 1923). This is the first record of a Sclerotinia rot of sweet potato in New Jersey, according to Poole.

Damping-off caused by Rhizoctonia sp. was reported from Florida. Rhizoctonia sclerotia were found on Nancy Hall sweet potatoes bedded for sprouts in a greenhouse in New Jersey, but the fungus did not cause any rot of the tubers or sprouts (Pl. Dis. Reporter 7: 13. June 15, 1923).

Mottle-necrosis and internal breakdown are described by Harter, Lauritzen, and Weimer (1 and 2).

Storage rot not distinguished as to cause is reported by Temple and Jehle of Maryland to have caused a loss of 25% of the 1922 crop stored during the winter of 1922-1923. This is attributed to over-crowding and poorly constructed houses.

Other diseases and injuries reported were surface rot caused by Fusarium oxysporum Schlecht., New Jersey, Mississippi, Alabama; foot rot caused by *Plenodomus destruens* Harter, Maryland; *dry rot* caused by *Diaporthe batatatis* Harter & Field, Missouri; *root rot* caused by *Ozonium omnivorum* Shear, Texas (loss 6%); *leaf-spots* caused by *Phyllosticta batatas* Cke., New Jersey, Florida, Alabama, Porto Rico; and by *Alternaria* sp., California; so-called *mosaic*, cause unknown, Florida, Mississippi, Arkansas, Kansas (first report); *root-knot* caused by *Heterodera radicicola* (Greef) Müll., Arkansas, California; *sooty mold* caused by *Meliola* sp., Porto Rico (caused some loss); *wet mold* caused by *Choanephora* sp., Florida (caused death of many leaves; especially active in the mornings; not important); *slime molds*, *Fuligo violacea* and *Physarum plumbeum*, Alabama.

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DISEASES OF BEAN

Bacterial blight caused by *Bacterium phaseoli* EFS.

Bacterial blight was reported as more prevalent than usual only in Virginia, about the same as usual in Massachusetts, New York, West Virginia, Louisiana, Texas, Indiana, Minnesota, North Dakota, and Colorado, and less than usual in Delaware, Ohio, Illinois, Wisconsin, Iowa, and Arizona.

The estimated losses in Michigan were 10%; Virginia, 8-10%; New York, 3-10%; Alabama, 3%; South Carolina and Texas, 2%; Maryland, 1.5%; Minnesota and New Mexico, 1%; Delaware, .5%; and a trace or no estimate in the other states.

The dates of first recorded appearance are:

May- - - - Baton Rouge, La.
June 18- - Green County, N. Y.
June 18- - Floyd, Ind.
July 7 - - Calhoun, S. C.
July 19- - Woodside, Del.
July 20- - Madison, Wis.
July - - - Wayne Co., Ohio
July 25- - St. John, Ariz.
Aug. 15- - State College, N.M.
Sept.- - - Fort Collins, Col.

Varietal susceptibility is noted as follows: Chupp, of New York, says blight is most severe on White Kidney; Learn, of Colorado, says more blight on bush beans than pole beans; Gardner, of Indiana, says: "In a plot of 59 varieties, planted late, the following escaped infection: Golden-eye wax, *Vicia faba*, White Dutch Runner, Scarlet Runner, and only a trace occurred on Lazy Wife, Horticultural Cranberry, Rustless Golden Wax. Infection was noted on Dutch Caseknife as in 1921." The observations of Gloyer in New York agree with those of Gardner.

Burkholder (1) has recently published the results of three years' (1919, 1920, 1921) tests on the susceptibility of bean varieties to bacterial blight. He found that none of the varieties of the common bean possess immunity to blight, and discovered none that is highly resistant. There are, however, considerable, and apparently rather constant, differences in susceptibility. He stated also that as a rule, although not always, the resistant varieties are later in maturing, while those that are severely affected are early. Tables are given indicating the relative susceptibility of the varieties tested. Several other species of Phaseolus and other closely related genera were tested by inoculation experiments during 1919, and all were found to be more or less susceptible. They included Henderson's Bush Lima (*Phaseolus lunatus*), the white Tepary (*P. acutifolius latifolius*), the moth bean (*P. aconitifolius*), the Adzuki bean (*P. angularis*) the Mung bean (*P. aureus*), the California Black-eye cowpea (*Vigna sinensis*), the Ito San soybean (*Soya max*), and the Georgia velvet bean (*Stizolobium deeringeanum*).

Gloyer (2) has found that late planting reduces susceptibility to blight, and that there are two periods of susceptibility. "The first period begins with the germination of diseased seed and ceases with the formation of the third leaf. The second period begins at pod formation and continues until maturity. Some resistant varieties and crosses owe their resistance to the delay of pod formation until the cool days of September."

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2. Gloyer, W. O. The effect of late planting on the bacterial blight of beans. (Abstract). Phytopath. 14: 27. Jan. 1924.

Wilt caused by Bacterium flaccumfaciens Hedges

Bacterial wilt was reported by Coons as of considerable importance in Michigan. He thinks that it has been present in that state prior to 1923, but that it has not been distinguished from blight. Miss Hedges (1), of the United States Laboratory of Plant Pathology, has isolated the causal organism from seed secured in Michigan, South Dakota, Montana, Maryland, and the District of Columbia, France, and Germany. Previously it had only been reported from South Dakota.

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Anthracnose caused by Colletotrichum lindemuthianum (Sacc. & Magn.) Br. & Cav.

Anthracnose was much less prevalent in 1923 than for several years. This was attributed to the generally dry season. About the same amount as usual or slightly more was reported from Maryland, Mississippi, Alabama, and Louisiana, where rains occurred during the ripening of the spring crop. Gardner reported the first occurrence of anthracnose in the past four years in Indiana. Brown, of Arizona, says: "None reported. I have seen the disease only a few times here in Arizona in a period of fourteen years. I believe that disease-free seed could be grown profitably for use in other states."

Table 32. Prevalence of and losses from anthracnose of bean, 1923.

State	Prevalence	Percentage loss	State	Prevalence	Percentage loss
Vt.	less		Okla.	prevalent	
Mass.	less		Ark.	same	2
Conn.	less		Ohio	same	
N..Y.	much less		Md.	more	1
N. J.	much less		Wis.	less	t
Del.	much less	1	Minn.	same	t
W. Va.	same	4	Iowa	less	t
Va.	same	2	Mo.	local	t
Fla.	less	t	N. D.	same	t
Ala.	serious	4	N. M.	slight	2
Miss.	more	2	Ariz.	not reported	0
La.	same (slight increase)				

The variety Burpee Stringless Greenpod was reported as quite susceptible in Delaware. Adams stated that "One canner distributed 150 bushels of seed of that variety, all from the same source. Some of the growers brought in beans showing as much as 40% infection. It was estimated that the average infection was about 3%."

Burkholder (1) has described a new strain of the anthracnose fungus which he calls the gamma strain. This strain attacks both of the two most important varieties, Wells' Red Kidney and White Imperial, resistant to both the alpha and beta strains. It is closely related to the latter, and is believed by Burkholder to be a mutation from it.

Leach (2), using 15 cultures of Colletotrichum lindemuthianum from various sources, obtained at least 8 different biologic forms. Some of these react differently on only one or two varieties, but he believes that they should, nevertheless, be considered distinct. He found no significant differences in morphology nor in temperature relations of the various forms. The cardinal temperatures as determined in agar cultures were 0°C., 22.5°C., and 32-34°C. There was no increase in the virulence of any one form by constant association with a resistant host; and all efforts to break down the resistance of a variety by wounding, etc., failed. The age of the tissue inoculated influences the type of lesion produced on susceptible hosts, but does not affect the resistance of resistant varieties.

Literature cited

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2. Leach, J. G. The parasitism of Colletotrichum lindemuthianum. Minnesota Agr. Exp. Sta. Techn. Bul. 14: 1-41. March 1923.

Not Cited

Anon. Bean anthracnose. New Hampshire Agr. Exp. Sta. Bul. 208: 24, 25. 1923.

Experiments were made by W. L. Doran on the control of bean anthracnose by heating diseased seed for two hours at 80°C. (176°F.), by dusting and spraying with Bordeaux mixture, and by covering the plants during rainy weather until the cotyledons had fallen. Spraying with Bordeaux mixture gave better results than dusting, and covering the plants gave a very satisfactory degree of control. Heating diseased seed gave less protection.

Mosaic, cause unknown

This disease caused about the same amount of loss as usual. The following table will indicate the distribution and severity.

Table 33. Bean mosaic losses, 1923.

State	Loss %	State	Loss %
Conn.	2 reports	Ark.	same, 2-3%
N. Y.	less, t-5%	Ind.	most serious disease
Va.	increasing, t	Wis.	same, t-5%
Fla.	rare	Minn.	same, 1%
Ala.	scattered, t	Iowa	more, 5%
Miss.	common, 2%	Utah	more, 3%
Okla.	prevalent, t	Idaho	present, t
Md.	same, t		

Chupp reports that mosaic is becoming less important in New York because resistant varieties are being used. Gardner says mosaic is the most serious disease of beans in Indiana. It was noted on 38 out of 59 varieties in a test plot, including *Vicia faba*, Flageolet, Mexican Red, and Dutch Caseknife (*Phaseolus multiflorus*). Of the varieties escaping infection in 1921 and 1922, Black Valentine showed 2 mosaic plants out of 27, while Wardwell's Kidney Wax (25 plants) remained mosaic free.

Root and stem rot caused by *Fusarium* spp.

Root rot seems to be widespread on beans. The prevalence of this disease in 1923 was reported as follows:

New York - - - - 5-10%
Virginia - - - - 6-10%
Kentucky - - - - universal
Indiana - - - - trace
Maryland - - - - same, trace

Minnesota - - - - trace
South Carolina - - 2%
New Mexico - - - - 1%
Washington - - - - trace

In the last named state it was found by Heald to be causing severe injury in one field at Spokane. In California, *Fusarium* sp. and *Rhizoctonia* sp. together caused a loss of 3%. Fromme reports that the Bird Eye variety is severely affected. This is grown extensively (12,000 cases) as a dry shell bean in southwest Virginia. Gardner reports the results of a demonstration test in Kentucky as follows:

Red Valentine - - - - - - - - - - no injury
Burpee's Stringless Greenpod - - no injury

Refugee wax - - - 80% failure
1000 to 1 - - - - failure

The organism was reported as *F. martii phaseoli* Burkholder in New York, as probably that species in Indiana; and in Washington as apparently identical with it. This would make the first report from Washington.

Root rot and canker caused by *Rhizoctonia* sp.

This type of root rot was reported locally from Massachusetts, New York, Florida, Alabama, Louisiana, Texas, Colorado, Idaho and California. It seems to be especially severe on summer and fall plantings in Louisiana and Texas, where Taubenhaus reports that no snap beans are grown in the summer on account of Rhizoctonia and Fusarium, which generally kill out the stand. Weber, of Florida, reports: "This type of stem trouble associated with wet weather. A fifteen acre field near Hastings was a total loss and several fields in the vicinity suffered 40%-80% loss. The plants were killed while in the 4-6 leaf stage The fungus weakened the stem so that the plants fell over while yet green and healthy looking."

Rust caused by Uromyces appendiculatus (Pers.) Lév.

This disease was of the usual minor prevalence with the exception of New Mexico, where Crawford estimates a loss of 10%. It generally appears late in the season, hence the small amount of loss. Fromme, of Virginia, says it is general on susceptible varieties but does not seriously affect commercial fields because resistant varieties are grown.

The following reduction in yield is estimated from the different states from which reports were received: New Mexico, 10%; Louisiana, 2-3%; California, 2%; Virginia and West Virginia, 1%; New York, Maryland, North Carolina, South Carolina, Florida, Alabama, Mississippi, Ohio, Iowa, Missouri, and Colorado, only a trace of occurrence with practically no loss.

The Kentucky Wonder variety is reported as most susceptible from New York, Louisiana, Missouri, and Colorado. Milbrath says the rust is particularly severe on Black-eye string beans and Pink beans in California. The only control for rust seems to be the use of resistant varieties and early planting to escape the disease.

Other diseases

Stem blight caused by Macrophoma phaseoli Maubl. was important locally in South Carolina. The beans in this case were partly Kentucky Wonders and partly bush beans.

Southern wilt caused by Sclerotium rolfsii Sacc. was reported as scattered in Florida and Texas, doing from a trace to 2% damage. Weber, of Florida, says that this disease was most destructive in May and June, or whenever the pods come in contact with the soil.

Dry weather caused considerable stunting of beans in Wisconsin and Minnesota.

Frost which occurred over wide areas of the southern states February 19, 1923, caused considerable loss to the bean crop maturing at that time.

Other diseases and injuries reported are powdery mildew caused by Erysiphe polygoni DC., Connecticut, New York (on greenhouse beans), Texas, California (about 1% loss); leafspot caused by Cercospora cruenta Sacc., Florida, Texas; watery soft rot caused by Sclerotinia libertiana Fckl., New York, West Virginia; root rot caused by Ozonium omnivorum Shear, Texas (caused 10% reduction in yield in black lands); black root rot caused by Thielavia basicola (B. & Br.) Zopf., New York; root knot caused by Heterodera radicicola (Greef) Müll., Texas (2% reduction in yield; greatest loss in sandy loam soils); chlorosis due to too much lime in the soil, Texas, (caused 1% reduction in stand).

Downy mildew caused by Phytophthora phaseoli Thax. was reported as less prevalent than usual in New York, New Jersey, Pennsylvania and Ohio due to the dry season. In New Jersey it was severe late in the summer in some sections, but did not occur on the early crop. It was more severe than usual in sections of Delaware and Kentucky, where local rains made conditions favorable for infection. Some of the fields in New Castle County, Delaware showed 50% pod infection.

Bacterial spot caused by Bacterium viridifaciens W.B.T. (2) was reported from New York, Indiana, and Wisconsin. Chupp, of New York, says: "I worked with this organism since 1918 when it was first observed on lima beans in war gardens at Ithaca. My results were substantially the same as those published recently by Tisdale." Gardner, of Indiana, thinks that this organism is probably identical with Bacterium vignae on cowpeas.

Pod rot attributed to Botrytis cinerea Pers. with a question mark was reported at Irvine, California, August 24 by Harter and Weimer.

Pod blight caused by Diaporthe phaseolorum (C. & E.) Sacc. was reported from New Jersey, Delaware, South Carolina (one report), and for the first time from Mississippi. Adams says it was much more prevalent in Delaware than last year owing to wet weather.

Mosaic (cause unknown) was reported as of more than the usual prevalence in Delaware and constituting a problem of increasing importance. Its occurrence was also noted in Oklahoma.

Powdery mildew caused by Erysiphe polygoni DC. was reported from Connecticut and California (common in Venturia, Santa Barbara, and Santa Ana Counties).

The tobacco wildfire organism, Bacterium tabacum Wolf and Foster was reported on lima beans in Massachusetts (Pl. Dis. Reporter 7:47. Aug. 1, 1923).

Yeast spot caused by Nematospora phaseoli Wing. was reported from Illinois for the first time. The seed for this crop came from California two years ago. (1)

Root rots caused by Rhizoctonia sp. and Verticillium sp. were observed in California by Harter and Weimer.

Drought conditions caused considerable loss to the mid-season crop in Delaware.

Literature cited

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DISEASES OF ONION

Smut caused by Urocystis cepulae Frost

This disease occurred in about the usual amounts in Massachusetts, New York, Ohio, Indiana, and Illinois. It was less prevalent than usual in Wisconsin, seen for the first time since 1916 in Kansas, and reported for the first time in Minnesota. Coons, of Michigan, says smut is not known in that state. The formaldehyde drip treatment caused damage in some fields in Massachusetts where, according to Anderson, "Owing to the dry condition of the soil at the time of application there was considerable injury to the seed from this source."

Recent literature

Anderson, P. J. The relation of soil moisture to formaldehyde injury of onion seedlings. Phytopath. 13: 392-403. Sept. 1923.

________________ Susceptibility of species of Allium to onion smut. (Abstract). Phytopath. 14: 26. Jan. 1924.

________________ and A. V. Osmun. An improved formaldehyde tank for the onion drill. Phytopath. 12: 161-168. 1923.

Walker, J. C. and F. L. Wellman. Temperature relations of Urocystis cepulae (Frost). (Abstract). Phytopath. 14: 26. Jan. 1924.

Other diseases

Neck rot caused by *Botrytis allii* Munn, was reported as less prevalent than usual in New York, Ohio, Indiana, Wisconsin, Idaho, and Washington. The dry season is considered to be in part responsible for the improved condition.

White rot caused by *Sclerotium cepivorum* Berk. on multiplier onions was reported from Norfolk, Virginia. This is a common European disease, but only one other authentic report of its occurrence in this country had been made, from Oregon in 1918, according to Walker (4).

Fusarium bulb rot caused by a fungus closely resembling *Fusarium cepae Hanzawa* is said to be commonly destructive in the onion set growing sections of Illinois. (2). A Fusarium bulb rot was reported as less common than usual in Wisconsin, and a small amount was reported from Minnesota and Idaho.

Pink root caused by *Fusarium malli* Taub. was reported from New York (3-7%), Louisiana, (same as usual), Texas (4%), Washington, (severe in Walla Walla section), California, (widely prevalent with losses from 2 to 80% per field, especially severe in the Delta region). Rosa, of California, says: "One of the most serious aspects of this disease is the infection of bulbs intended for seed production."

Smudge caused by *Colletotrichum circinans* (Berk.) Vogl. was reported on White Portugal and Southport White Globe from Delaware. It was also noted in Wisconsin and Illinois, chiefly on white sets. The results of recent investigations on resistance to onion smudge have been presented by Walker (3). He states that in general white varieties are susceptible and colored varieties are resistant. Apparently resistance depends on the presence of some substance associated or identical with the coloring matter in the dry outer scales of resistant bulbs. The inner succulent scales of bulbs of colored varieties were attacked as readily as with white forms. All varieties tested in the seedling stage were equally susceptible.

Mold caused by *Macrosporium parasiticum* Thüm. was reported from New York, Minnesota, Louisiana, Florida, and Porto Rico. In the southern section of

Louisiana it was very severe, causing in some cases a 100% infection with a 50% loss of seed crop. It was widely prevalent on upper leaves and seed stalks in Florida but was not considered of serious importance.

Downy mildew caused by Peronospora schleideni Ung. was of local occurrence in low, poorly drained areas in New York, Louisiana, Ohio, and California.

A new leafspot of onion and garlic has been described by Welles (5) as Cercospora duddiae. The disease, which causes severe injury, especially to garlic, has been noted since January, 1922 at the College of Agriculture, Los Baños, Philippine Islands.

Frost on February 14, 1923 did considerable damage to the Texas onion crop in the Laredo district. Taubenhaus considers the freeze responsible for the many splits and doubles which occurred.

Other diseases reported were black mold caused by Aspergillus niger van Tieghem, Texas (1% loss to onions in transit); crown rot caused by Sclerotinia sp., California (new to state (1); soft rot caused by Bacillus carotovorus Jones, Ohio, Indiana; bacterial heart rot, Ohio (frequently seen on the markets but not reported by growers); leafspot caused by Botrytis cinerea Pers., Florida (caused considerable foliage loss near Gainesville); dodder (Cuscuta gronovii Willd.), New York, Delaware.

Literature Cited

1. Smith, E. H. Some diseases new to California. (Abstract). Phytopath. 14: 125. Feb. 1924.

2. Tims, E. C., and J. C. Walker. A Fusarium bulb rot of onion. (Abstract). Phytopath. 14: 26-27. Jan. 1924.

3. Walker, J. C. Disease resistance to onion smudge. Jour. Agr. Res. 24: 1019-1039. June 23, 1923.

4. ____________ Occurrence of white rot of Allium (Sclerotium cepivorum Berk.) in Europe and America. (Abstract). Phytopath. 14: 26. Jan. 1924.

5. Welles, C. B. A new leaf spot disease of onion and garlic. Phytopath. 13: 362-365. Aug. 1923.

DISEASES OF CRUCIFERS

CABBAGE

Clubroot caused by Plasmodiophora brassicae Wor.

This disease was of about the same or slightly less prevalence in 1922 as in previous years. The collaborators in New York and Minnesota each estimated a 2.5% loss. The reports were of a trace of loss in Massachusetts, New Jersey, Maryland, Pennsylvania, Ohio, Indiana, Illinois, Michigan, Wisconsin, Iowa, and North Dakota. Clubroot was not reported from any southern state. It was observed both in seedling and mid-summer stage of plant development. Chupp, of New York, reports an interesting observation on control, "Reed Brothers, well known cabbage growers, state that on their farms a six year rotation, with cruciferous weeds absent, will eradicate the slime mold."

Gloyer and Glasgow (1) have reported that the development of the disease may be prevented by one application of mercuric chloride solution (1-1280) to seedlings in the seed-bed. Other solutions tried had no effect.

Monteith (2) has studied the relation of soil moisture and temperature to infection of cabbage seedlings by the clubroot organism. He concludes that temperatures favorable to the growth of the cabbage plant have little effect on the development of clubroot. The optimum temperature for the disease is the same as that for the normal development of the host. Soil moisture, however, is an influential factor. Infection occurs at a moisture content of about half the water-holding capacity of the soil; below that the disease does not develop; above it it increases in severity with higher moisture content up to saturation.

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Miller, Herman (Thurgau) and A. Osterwalder. Weitere Versuche zur Bekampfung der Kohlhernie. Landw. Jahrb. Schweiz 37: 153-182. 1923.

Yellows caused by *Fusarium conglutinans* Woll.

The yellows disease was of more than usual prevalence in Long Island, New Jersey, Delaware, Maryland, Mississippi, Texas and Illinois. It was reported from California for the first time (1).

Table 34. Distribution, prevalence, and losses of cabbage due to yellows in 1922 and 1923.

State	Prevalence		State	Prevalence	
	1922	1923		1922	1923
N. Y.	Present	Major on Long Island	Ark.	Same .15%	
N. J.		More in South	Ohio	Limiting factor	Same
Pa.	Present	Somewhat less			
Del.	.5%	Increasing	Ind.	More .5%	Less 3%

	Prevalence			Prevalence	
State	1922	1923	State	1922	1923
Md.	Same	.8%	Ill.	5.	More 5.5%
N. C.		Less	Mich.	Very serious	
S. C.	Trace		Wis.	More	Less
Ala.		Important	Iowa	.25%	.25%
		2.5%	Mo.	Less, 10%	Less
Miss.	General	1 (much	N. D.	Present	Less
		more)	Kans.	More .35%	As usual
Tex.	.18%	.20%	Col.	Present	
			Mont.	Present	

The hot summer and delay in the maturity of the southern cabbage crop to bring it into hot weather were contributing factors in the increase in severity of cabbage yellows. Clayton reports as high as 60% infection in some fields in Nassau County, Long Island. In Camden County, New Jersey, one field of Copenhagen showed 66% infection and another 96%. Adjoining rows of Early Jersey Wakefield showed less. Temple says that losses of 20 to 50% are much more common in Maryland than formerly. The explanation for the relatively less amount of yellows in Indiana may be found in the better distributed rainfall, which tended to keep the soil temperature lower than in neighboring states of Ohio and Illinois. Two new locations for yellows were observed in Wisconsin, one in Rock County and another in Grant County. White says it is coming to be difficult to find a cabbage field in Kansas that does not have yellows. Yellows was not observed in North Dakota, although it has been reported in previous years.

Recent Literature

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Shannon, Harry. The history and extent of Fusarium wilt of cabbage yellows in the Nichols-Muscatine district. Rep. Iowa State Hort. Soc. 57: 438-439. 1923.

Stokdyk, E. A. Progress report on cabbage yellows investigations in Kansas. (Abstract) Phytopath. 14: 24. Jan. 1924.

Wisconsin All Seasons and Wisconsin Brunswick are resistant if started in greenhouse or hot bed and transplanted but sometimes show yellows when sown directly in the field. Iowa Copenhagen is also giving satisfaction. Three varieties from Scotland gave some resistance. Seed transmission was not shown. F. conglutinans callistephi Beach causing aster wilt failed to cause yellows in cabbage.

Tisdale, W. B. Influence of soil temperature and soil moisture upon the Fusarium disease in cabbage seedlings. Jour. Agr. Res. 24: 55-86. 1923. Abs. in Exp. Sta. Record 49: Dec. 15, 1923.

Black rot caused by Bacterium campestre (Pammel) EFS.

Black rot was as a rule less severe in 1923 than 1922. Exceptions where more of the disease was reported are Louisiana, Texas, Indiana, and Illinois. In Maryland, black rot was about the same as usual. The low rainfall in New York and Wisconsin is thought to be one reason for the decrease in amount of black rot in those states. Then too, the corrosive sublimate seed treatment, which is being adopted in several sections of Wisconsin, is showing good results. In Illinois, Tehon reports black rot as about equal to yellows in importance and to have been reported from 17 counties which comprise all the trucking districts. In some fields near Chicago nearly every plant was destroyed.

Table 35. Estimated loss from and dates of earliest appearance of black rot of cabbage, 1923

State	Percentage loss	Date and locality of first appearance
Massachusetts	trace	---
New York	trace-2	September 17, Tompkins County
Delaware	0.5	July 26, Seaford
Maryland	trace	---
Alabama	0.5	---
Mississippi	5.	April 30, Washington County
Louisiana	1-5	January, Baton Rouge
Texas	4.	---
Ohio	one report	August 29, Stark County
Indiana	--	June
Illinois	4.	June 23, Quincy, Adams County
Wisconsin	2.	August 30, Stanley
Iowa	trace	---
North Dakota	trace	---

Blackleg caused by Phoma lingam (Tode) Desm.

Blackleg was less serious in 1923 than in 1922 with the exception of North Carolina, Indiana, and Minnesota. The estimated reduction in yield in

Minnesota was 3% of the crop. Chupp says blackleg was much less prevalent in New York, due partly to the dry weather and partly to the greater use of the hot water seed treatment in the Long Island section. There was about the same amount as usual in Maryland where it caused 1.5% loss. This disease was serious locally in Massachusetts. Osmun reported one field that had 90% plants damaged. The explanation for the increase of blackleg in North Carolina as given by Fant is an increase in concentration of cabbage growing and neglect of rotation given to this crop. Tisdale, of Florida, found blackleg in a field of cabbage plants that had recently been set with plants from a seed company near Charleston, South Carolina. Melhus says that blackleg has been practically eradicated in Iowa by seed treatment and seed bed rotation.

The control of blackleg infection in the seed can best be secured by using hot water treatment 50°C. for 30 minutes, according to the results obtained by Clayton (1) and by Walker (2). Clayton notes further that plants from the hot water treated seed stood transplanting with least loss and made the most uniformly vigorous growth in the field. This treatment was compared with the use of Bordeaux and of corrosive sublimate in both hot and cold solutions.

References

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2. Walker, J. C. The hot water treatment of cabbage seed. Phytopath. 13: 251-253. 1923.

Other diseases

Black mold or leafspot caused by Alternaria brassicae (Berk.) Sacc. was reported as more prevalent than usual in Illinois where it caused reduction in yield of .5%, chiefly in the southern part of the state. It was about the same as usual in Delaware, South Carolina, Florida, Alabama, and Louisiana, and less in New York and Wisconsin. In none of these states was there loss enough to estimate. Weber, of Florida, notes one case where leafspot caused damage on a crop that was not marketed until after warm weather had developed.

Downy mildew caused by Peronospora parasitica (Pers.) DeBary was reported present on cabbage seedlings and half grown plants in South Carolina, Florida, Louisiana, Texas, and Wisconsin. It was very scarce in Wisconsin and was not reported at all from Iowa and New York this season.

Slimy soft rot caused by Bacillus carotovorus Jones was important on mother seed plants in New York and Wisconsin. It is one of the limiting factors of cabbage seed growing in the central states as the rot usually starts following the unavoidable bruises of storage and handling. Soft rot also caused considerable loss in southern grown cabbage in transit from Alabama, Florida, Mississippi, Louisiana and Texas. Miles, of Alabama, writes: "Slight loss in field. Heavy loss in transportation. Several cars showed 75% stock decayed when reaching northern market, average of 35 cars was 25% showing trouble from this cause slight to serious." Neal and Barker, of Mississippi, attribute the severe losses to excessive rainfall during the growing and shipping season. There was less than the usual amount of soft rot in fields in Ohio and Wisconsin but more in Maryland causing a loss of 1%.

Watery soft rot caused by Sclerotinia libertiana Fcl. was reported only from New York and Louisiana. Chupp, of New York, says it was particularly common in the Geneva-Phelps district on late harvested Krout cabbage, estimated loss to the state 2%. About the same loss, 2%, occurred in Louisiana. The period of greatest injury in Louisiana was January to March.

Root rot caused by Rhizoctonia sp. was reported as severe in the University breeding plots at Cornell on one strain only. Rhizoctonia sp. caused a seedling rot or damping-off in Indiana, and a summer rot in California.

Olpidium brassicae (Wor.) Dangeard was found on roots of tomato, tobacco, and cabbage plants in a greenhouse in the University of Wisconsin. This is the first time it has been reported in this country. (1); leafspot caused by Bacterium maculicolum McCulloch, Louisiana; blotch caused by Cercospora bloxami B. & Br., Florida; ring-spot caused by Mycosphaerella brassicicola (Duby) Lindau, western Washington (common as usual on the seed crop - J. C. Walker); damping-off caused by Pythium sp., Florida (considerable damage in seed beds); southern blight caused by Sclerotium rolfsii Sacc., Texas; root-knot caused by Heterodera radicicola (Greef) Müll., Alabama (loss 1%), Texas (loss 2%): seedling blight probably due to sunscald, Florida; bursting due to continued rains and warm weather, Wisconsin (more loss than usual from this cause).

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BRUSSELS SPROUTS

Black rot caused by Bacterium campestre (Pammel) EFS. was reported by Clayton on Long Island. He reports the result of seed treatment for the control of this disease as follows: (See Cabbage, blackleg, reference 1).

> "Check, primary systemic black rot 37.8%. $HgCl_2$, 1 to 1000, seed soaked 30 min. 18.6%. Hot water 50°C., seed soaked 25 and 33 min., none. $HgCl_2$; 1 to 1000 applied 3 times to plants in bed as for maggot control, none. Bordeaux 4-5-50 applied to plant bed as $HgCl_2$, 22.3%."

CAULIFLOWER

Black rot caused by Bacterium campestre (Pammel) EFS. was reported as general in New York, but causing less damage than usual; loss ranging from a trace to 1%. In Illinois Tehon reported more than usual especially in the northern part; loss .5%.

Clayton (1, 2) states that cauliflower is very susceptible to this disease, which is very destructive on Long Island. Seed infection is probably the main means of overwintering of the organism, but it may also overwinter in the stems of diseased cabbage and brussels sprouts plants which happen to survive. Insects are apparently the most important means of dissemination, particularly aphids. The disease may be controlled perfectly by the hot water treatment, 122°F. for 25 to 33 minutes, but this method reduces the germination of the seed. Excellent control in the seedbed is secured by three applications of corrosive sublimate solution (1 to 1,000 or 1 to 1,200). Late planting so that the crop develops during the cool fall months is recommended as a method of escaping black rot, since it is a warm weather disease.

Clubroot caused by Plasmodiophora brassicae Wor. was important in occasional fields in New York where cauliflower or cabbage seed had been grown for some time; losses, trace to 2%. The reduction in yield in Maryland was estimated at 5%, about as usual. Clayton states that the fact that this disease rarely causes appreciable losses on Long Island is due entirely to the care with which growers rotate cruciferous crops. (2).

Blackleg caused by Phoma lingam (Tode) Desm. was reported as much less than usual in New York. The Pierstorff variety showed 40% infection in one field in Monroe County.

> According to Clayton (2), cauliflower is not so badly attacked by blackleg as are cabbage and brussels sprouts on Long Island. This disease also is perfectly controlled by the hot water seed treatment as for black rot. The amount of blackleg is also greatly reduced by seed treatment with corrosive sublimate solution, 1 to 1000 for 30 minutes. Seedbed treatment with corrosive sublimate solution (see black rot) was next in effectiveness to the hot water seed treatment, but the latter method gave more vigorous plants.

Leafspot caused by Alternaria brassicae (Berk.) Sacc. was reported as a minor disease in New York and Florida. Weber, of Florida, says it did not prove serious except on plants that were planted late. It was most serious in April.

"Whiptail" is a non-parasitic disease of cauliflower which is very troublesome on Long Island, and is considered by Clayton (2) to be due to unfavorable soil conditions. The loss to Long Island growers in 1923 was estimated at 20 percent. Heavy fertilizing may cause whiptail, as is shown by the fact that in the experimental plats those receiving applications of high-grade commercial fertilizer at the rate of one ton to the acre had more whiptail than unfertilized plats. Where lime was broadcast at the rate of 3,600 pounds per acre just before setting the plants, the bad effect of the fertilizer was largely overcome. The greatest amount of whiptail was observed where the soil had previously been treated with inoculated sulfur for potato scab control. Some growers have designated different fields for rotation with potatoes where sulfur may be used, and other fields with cauliflower where lime may be applied.

Peppery spot caused by Bacterium maculicolum McCulloch, Long Island, New York; downy mildew caused by Peronospora parasitica (Pers.) DeBary, New York; watery soft rot caused by Sclerotinia libertiana Fckl., Louisiana.

Literature Cited

1. Clayton, E. E. A progress report on black rot investigations, with special reference to cauliflower on Long Island. (Abstract). Phytopath. 14: 24. Jan. 1924.

2. Clayton, E. E. Investigations of cauliflower diseases on Long Island. New York (Geneva) Agr. Exp. Sta. Bul. 506: 1-15. Jan. 1924.

CHINESE CABBAGE

Soft rot caused by bacteria, Missouri (severe damage confined to leaf bases of plants from a nursery in Pike County).

Leafspot caused by Cercospora bloxami B. & Br. was reported by Weber near Jacksonville, and St. Augustine, Florida. In one ten-acre field a 60% loss was reported. Plants were attacked from seedling stage to maturity.

COLLARDS AND KALE

Downy mildew caused by Peronospora parasitica (Pers.) DeBary, South Carolina, Florida; southern blight caused by Sclerotium rolfsii Sacc. Harrison County, Mississippi; yellows caused by Fusarium conglutinans Woll. was reported on cabbage and kale from California for the first time (Smith, E. H. Some diseases new to California. (Abstract). Phytopath. 14: 125. Feb. 1924.)

HORSE RADISH

Root rot caused by Thielavia basicola (B. & Br.) Zopf. was reported by Poole as causing slight loss in New Jersey. The quality of harvested roots was somewhat reduced.

Mosaic, cause unknown, Nassau County, New York, June 11; determined by K. H. Fernow.

White rust caused by Albugo candida (Pers.) Ktz., New York; leafspot caused by Cercospora armoraciae Sacc., Illinois, Missouri, Oklahoma; by Ramularia armoraciae Fckl., New York (very severe in Tompkins County, probably statewide); by Macrosporium herculeum E. & M., New Jersey; bacterial storage rot, New Jersey.

KOHL RABI

Downy mildew caused by Peronospora parasitica (Pers.) DeBary was reported by Weber as common in several gardens near Gainesville, Florida, but it did not appear to be doing any damage.

MUSTARD

White rust caused by Albugo candida (Pers.) Ktz. was reported from Cassville, New York; Calhoun, South Carolina; Florida; and Hurds County, Mississippi. In each case the damage was slight.

RADISH

Black root caused by Nematosporangium aphanidermatum (Edson) Fitz. (1) was noted locally at Indianapolis and Fayette, Indiana. White Chinese showed some resistance in a test plot of 22 varieties on "sick" soil. Kendrick (2) has found that the main avenue of infection by this fungus appears to be the point where the secondary root emerges from the cortex of the primary root. He also found evidence of systemic infection.

Damping-off caused by Mucor sp. was reported by Clinton in Connecticut. It is said to be the first occurrence in that state. It occurred under conditions of high moisture.

White rust caused by Albugo candida (Pers.) Ktz., New York, Oklahoma, Illinois, Wisconsin, Colorado; downy mildew caused by Peronospora parasitica (Pers.) DeBary, New York, California; powdery mildew, species not determined, Missouri.

Literature Cited

1. Fitzpatrick, H. M. Generic concepts in the Pythiaceae and Blastocladiaceae. II. Rheosporangium aphanidermatum Edson. Mycologia 15: 167-168. July 1923.

Rheosporangium aphanidermatus Edson and Pythium butleri Subramaniam are the same fungus. Edson's specific name antedates Subramaniam's, and the author proposes two new combinations, Pythium aphanidermatum and Nematosporangium aphanidermatum, but prefers the latter.

2. Kendrick, J. B. Infection-court in radish black root. (Abstract). Phytopath. 14: 66. Jan. 1924.

RUTABAGA

Black rot caused by Bacterium campestre (Pammel) EFS. was reported as minor in Madison, Wisconsin.

Powdery mildew caused by Oidium balsamii Mont. was reported from Florida, and said by Weber to be coextensive with the host and in certain instances causing total loss of the plants.

Downy mildew caused by Peronospora parasitica (Pers.) DeBary, Gainesville, Florida.

TURNIP

Anthracnose caused by Colletotrichum higginsianum Sacc. was reported of minor importance in Florida but causing a 1% loss in Alabama.

Powdery mildew caused by Oidium balsamii Mont. was reported from Florida. "Was common on both surfaces of the leaves of turnips. In some instances the leaves were totally covered and killed. It was especially destructive in March and April." (Weber).

Soft rot caused by Bacillus carotovorus Jones, New York, Florida; crown gall caused by Bacterium tumefaciens EFS. & Towns. Kansas; black rot caused by Bacterium campestre (Pammel) EFS., Louisiana, Colorado; white rust caused by Albugo candida (Pers.) Ktz., Alabama, Texas; downy mildew caused by Peronospora parasitica (Pers.) DeBary, Florida.

DISEASES OF CUCURBITS

CANTALOUPE

Leaf blight caused by Macrosporium cucumerinum Ell. & Ev. (Alternaria brassicae nigrescens Pegl.)

Leaf blight was reported from Connecticut, New Jersey, Pennsylvania, Delaware, the coastal plain of Maryland (10%), Texas (5%), Ohio (trace), Indiana (serious), Michigan (very severe in early September), and Missouri (one report). In cases where the damage was slight the fungus was retarded in its development by dry weather. According to Brisley (1), leaf blight has caused severe damage to cantaloupes in Arizona. Beach reports a loss of 33% in a three acre field in Delaware County, Pennsylvania. Adams stated that in Delaware:

> "Leaf blight is the most important disease affecting the Eden Gem variety, which shows good resistance to downy mildew. The Hybrid No. 2 variety is next in susceptibility. The commercial varieties grown in the state are practically resistant to this disease. The copper-lime-arsenate dusts have given practically complete control. It was more prevalent than last year and was found about two weeks earlier (July 20) than downy mildew."

Reference

1. Brisley, H. R. Studies on the blight of cucurbits caused by Macrosporium cucumerinum E. & E. Phytopath. 13: 199-204. 1923.

Wilt caused by Bacillus tracheiphilus EFS.

Wilt was reported as somewhat more than usual in prevalence in Connecticut, New York (2-5%), Illinois (1.5%), and Iowa (8%). It was about the same as usual in Pennsylvania, Maryland, Ohio, Michigan, and Wisconsin, and less in Kentucky and Indiana. Young, of Ohio, says: "Especially serious where melons or cucumbers have been repeatedly grown on the same land. Crop rotation, together with control of insects, has proved effective in preventing serious loss." Valleau says that in Kentucky very marked results have been obtained in the control of cucumber beetles, and hence of wilt, through the use of nicotine dusts.

Anthracnose caused by Colletotrichum lagenarium (Pass.) Ell. & Hals.

Anthracnose was noted from New York to Arizona and south to Florida and Alabama. The greatest losses are reported from Alabama, 10%, Minnesota and Iowa, 5%, New York and Illinois 1%. Other states reporting are: Delaware, Maryland, Virginia, South Carolina, Mississippi, Illinois, Michigan, Wisconsin, Iowa, Missouri and Colorado.

The severity of the disease seemed to coincide with periods of rain. In New York it developed late, September 24, on mature fruit and in Delaware early, July 27, on young immature fruit. It caused a spotting both on leaves and fruit. Weber says: "Anthracnose proved to be one of the most serious diseases of the host plant in Florida during the past season. It was found in the early part of April and developed rapidly until June, the end of the growing season of the cantaloupe. In several fields near Jennings and Williston it caused 10 to 20% loss. Attempts to control the fungus with copper lime dust did not prove satisfactory." Tehon says that in Illinois it is the most important cantaloupe disease next to wilt and may sometimes be more important. Losses as high as 30% are noted.

The Eden Gem, Pearl Pink, and Hybrid No. 2 have some resistance in the order named according to Adams, Delaware. Temple, of Maryland, reports Honey Dew as most severely attacked.

Mosaic (cause unknown)

Mosaic was reported as very prevalent in Delaware and on the increase from last year. It is now one of the most important diseases in that state according to Adams. It was also considered the worst cantaloupe disease in Indiana. Gardner says: "In Knox County, Indiana, heavy aphis infestation was followed by mosaic, too late, however, to ruin the fruit. The mosaic carriers, milkweed, pokeweed, and Physalis are abundant in Indiana." A few cases were noted in Ohio and somewhat more than usual in Illinois and Wisconsin. In Iowa there was about the same amount as usual, with a loss of 5%. The dates of first recorded appearance are: June 20, Delaware; July 11, Illinois; July 17, Indiana; August, Ohio.

Downy mildew caused by Pseudoperonospora cubensis (B. & C.) Rostow

Downy mildew was reported as less common and severe than last year in Delaware (25% loss) and Maryland (2.5% loss), but much worse than last year in South Carolina, Georgia, and Florida. In South Carolina it was first seen June 21 and by July 10 the vines were dead. The crop was almost a total loss, 95%. In Alabama, Mississippi, and Louisiana the disease was present but the epidemic came so late that the damage was not extensive. A 5% loss is estimated for Alabama. The downy mildew fungus was noted for the first time on cantaloupe in California, where it was collected September 12 by Harter and Weimer at Garden Grove.

The control of downy mildew depends much upon the weather, as the disease is stimulated by rains and lack of sunshine. Weber, of Florida, reports that the use of copper fungicides helped some in checking the disease but was not thoroughly efficient. On the other hand in Delaware Adams reports: "Copper-lime-arsenate dust proved very effective in checking the disease. The dusted vine matured a normal crop while untreated vines set hardly 75% of a normal crop. Approximately two hundred acres of cantaloupes were dusted this season as compared with less than ten acres in 1921." Under Delaware conditions the Pearl Pink variety showed greater resistance to downy mildew than Pollock or Hybrid No. 2. The Eden Gem showed best resistance but was very susceptible to leaf blight, Macrosporium cucumerinum.

Other diseases

Fusarium wilt caused by Fusarium sp. (niveum? vasinfectum?) was reported as a trace in Delaware, of some importance in Illinois and California, and very important in New Mexico where Crawford estimates a loss of 15%. He states that the temperature and moisture were both above normal and that all commercially grown varieties were equally susceptible.

Root knot caused by Heterodera radicicola (Greef) Müll. was reported as causing losses of 1% in Alabama, 2% in Texas, 6% in California, and a trace in Missouri. The infection in Missouri was in sandy lowlands in the southeastern part of the state.

Sun scorch or spray injury was reported July 22 from Meriden, Connecticut. This was caused by spraying in weather too hot and bright.

Cracked melons were more or less common in the latter part of the season, where rains followed dry weather in Connecticut and Wisconsin.

Two leafspots were reported from Delaware for the first time, Cladosporium cucumerinum E. & A., also noted in Colorado, and Septoria cucurbitacearum Sacc. Cercospora cucurbitae Ell. & Ev. was also reported from Delaware; powdery mildew caused by Erysiphe cichoracearum DC. from Connecticut, Florida, and Georgia (caused extensive loss in vicinity of Valdosta); southern blight caused by Sclerotium rolfsii Sacc., from Alabama (2% loss), and Texas (1% loss); soft rot caused by Bacillus melonis Giddings, from Virginia

CUCUMBER

Wilt caused by Bacillus tracheiphilus EFS.

Bacterial wilt was present in the eastern central, and southern states. It was reported more serious than usual in Illinois and Iowa and less than usual in Wisconsin and Minnesota; in other places about the same.

Table 36. Bacterial wilt of cucumber, relative prevalence, losses, and first appearance.

State	Importance	Loss %	First appearance	Place
N. H.	---	---	August 9	Manchester
Mass.	rather more	small	---	---
Conn.	usual	---	---	---
N. Y.	same	2.5	July 10	Monroe County
N.Y.(L.I.)	more	25 in some fields	---	---

State	Importance	Loss %	First appearance	Place
N. J.	present	trace	---	---
Md.	same	trace	August 20	Mickleton
Fla.	not common	trace	---	---
Ala.	" "	trace	---	---
Miss.	" "	trace	June 16	Stone County
Texas	usual	2	---	---
Ohio	usual	---	June 18	Stark County
Ind.	less	---	July 24	Lake County
Ill.	much more; 60% 1 field	2.5	July 18	Clinton County
Wis.	less	1.0	July 10	Madison
Minn.	less	---	---	---
Iowa	more	14	---	---

There were no observations on control or varietal resistance in connection with the wilt disease.

Mosaic, cause unknown

This disease continues to be one of the widespread and destructive diseases of cucumber. It was reported as of increasing importance on Long Island, New York and in Delaware, Indiana, and Illinois. It was said to be the major disease of the crop in Wisconsin, causing a loss of 15%, although less prevalent than in 1922. It was reported about the same as usual in Massachusetts, New York, Maryland, Florida, Louisiana, Ohio, Michigan, Minnesota, and Iowa. It occurred also in Rhode Island, Alabama, and California. Doolittle reported extensive losses, ranging from 25 to 60%, in greenhouses in the Chicago district.

The variety Davis Perfect was noted as susceptible in Delaware. In Illinois one field of Klondike showed 50 to 70% of mosaic. Clayton, of Long Island, N. Y. reports no mosaic on milkweed. Pokeweed with mosaic was common and possibly was the wild carrier. Doolittle, of the U. S. Department of Agriculture Station at Madison, Wisconsin reports cucurbit mosaic on cucumber, squash, pumpkin, muskmelon, wild cucumber, milkweed, pokeweed, Physalis, and Amaranthus. Crawford reports finding mosaic on a wild cucurbit, _Apodanthera undulata_, in Otero County, New Mexico.

Recent literature

Bowley, W. F. Mosaic disease of the cucumber. Ann. Rep. Exp. & Res. Sta. Nurs. & Mark. Gard. Indus. Soc. 8: 43-45. 1923.

Doolittle, S. P. and M. N. Walker. Cross inoculation studies with cucurbit mosaic. Science 57: 477. Apr. 30, 1923. (Rev. in Exp. Sta. Record 49. Nov. 1923, and Rev. Appl. Myc. 2: 512. Nov. 1923.)

Cucurbit mosaic has been transferred to 8 genera, 23 species, and 8 botanical and 96 horticultural varieties of plants. Citrullus is the only genus proved resistant. Cucumber mosaic transferred to martynia, pepper, milkweed, and pokeweed is transmissible back to cucumber. Inoculation was by aphis transfer, crushed tissues, and expressed juice. Cucumber mosaic was transmissible to tobacco, then to pepper. The potato was found susceptible as was also pigweed (Amaranthus retroflexus), and a cultivated ground cherry (Physalis sp.)

Doolittle, S. P. and M. N. Walker. Experiments on the control of cucurbit mosaic. (Abstract) Phytopath. 14: 56. Jan. 1924. The importance of the overwintering host of cucumber mosaic varies with the locality. Pokeweed seems most important in southern Illinois. It also occurs in Indiana, and Michigan. Physalis and milkweed seem to be important in Wisconsin. After eradication of milkweed at Madison the amount of mosaic changed from 100% in 1916 to 1922 to 6% in 1923. Pokeweed eradication in southern Illinois was also satisfactory.

Walker, M. N. Physalis and cucurbit mosaic intertransmissible. (Abstract) Phytopath. 14: 56. Jan. 1924.

Angular leaf spot caused by Bacterium lachrymans EFS. & Bryan

This disease was generally prevalent in Delaware although of slight importance. It was of minor importance in Illinois, Wisconsin, Iowa, and California and was reported from Florida. In Alabama it was reported as causing a serious loss, estimated at 5%. Coons, of Michigan, says: "Angular leaf spot was the most serious disease of cucumber in 1923, doing a great deal of damage through effects on leaves of pickling varieties and in causing rot of the fruit in seed cucumbers of the greenhouse forcing varieties." Weber, of Florida, reports some success in the use of liquid Bordeaux mixture. Adams, of Delaware, noted that angular leaf spot was very severe on Davis Perfect variety.

Anthracnose caused by Colletotrichum lagenarium (Pass.) Ell. & Hals.

The anthracnose disease of cucumbers was of minor prevalence in 1923 in Massachusetts and New York. The late planted crop in Delaware suffered most, but the disease did not show up in any amount until after the harvest of the commercial crop. It was the most important cucumber disease of the year in Alabama, causing reduction in yield estimated at 10%, and being reported as affecting more or less 20% of the cucumbers in 20 cars shipped to northern markets. One very heavy infection was reported from Mississippi. It was reported as a minor transit disease in Texas. It was more prevalent than usual in Indiana, Illinois and Wisconsin, although it was not serious except locally. The disease was very severe on the variety Davis Perfect in Delaware, according to Adams.

Downy mildew caused by Pseudoperonospora cubensis (B. & C.) Rostow

This disease was less prevalent than usual in New York and confined almost wholly to Long Island. There was considerable downy mildew in New Jersey, Delaware, (2% loss), and Maryland (1% loss). In South Carolina downy mildew appeared toward the close of the season and reduced the estimated crop 30%. In Florida the loss was extensive in the southern part of the state but less in the central part. The loss for the state as a whole is set at 30%. This disease was present and locally important in Alabama, Mississippi, and Louisiana. It was reported only as a greenhouse trouble in Indiana and not at all in Ohio and Wisconsin. Harter and Weimer reported it as common and causing some damage in Garden Grove and Santa Ana, California.

Downy mildew is greatly influenced by the amount of moisture present. If moisture is plentiful, Weber of Florida states that spraying has little effect in checking the fungus. Where the rainfall was less, spraying with liquid Bordeaux mixture gave considerable protection. Check rows under similar conditions were almost a complete failure.

Other diseases

Powdery mildew caused by Erysiphe cichoracearum DC. was reported as occurring in field and greenhouse in California and causing a 3% loss. The powdery mildew in Massachusetts and Mississippi is designated as E. polygoni and said to be more destructive than usual in greenhouses. The Boston market garden district lost from 30 to 40% of the crop from this cause.

Root knot caused by Heterodera radicicola (Greef.) Müll. was reported as very important in many greenhouses in New York. Chupp says few growers sterilize thoroughly enough to kill the nematodes. The loss to cucumbers in greenhouses of California was estimated by Milbrath at 6%. In Alabama a 1% loss occurred in the field, and in Texas a 3% loss.

Leafspot caused by Septoria cucurbitacearum Sacc. was observed for the first time in Delaware, and occurred in Pennsylvania also. Other leafspots reported were Macrosporium cucumerinum Ell. & Ev., from New Jersey and Maryland; and Phyllosticta cucurbitacearum Sacc. from New Jersey. Scab caused by Cladosporium cucumerinum E. & A. was reported from New York, Pennsylvania, Michigan (total loss of crop in some fields near Grand Rapids), Wisconsin; fruit rot caused by Pythium debaryanum Hesse, from Connecticut (considerable loss in one lot in the market); Sclerotium sp., Illinois (southern blight (?), a single instance found in Sangamon County - Tehon); rot caused by Sclerotinia libertiana Fckl., Idaho; stem rot, cause undetermined, Iowa.

PUMPKIN

The pumpkin is very free from diseases. Adams reported that in Delaware downy mildew caused by Pseudoperonospora cubensis (B. & C.) Rostow was less prevalent than usual; powdery mildew caused by Erysiphe cichoracearum DC. was more common; and Cercospora cucurbitae Ell. & Ev. and Colletotrichum lagenarium (Pass.) Ell. & Hals. were found on pumpkin for the first time in that state.

SQUASH

Wilt caused by Bacillus tracheiphilus EFS. was reported coextensive with the crop in New York and causing a 2 to 3% loss. Traces of wilt were reported from Ohio, Illinois, and Iowa. This disease was reported from Kansas for the first time on squash according to Stokdyk.

Downy mildew caused by Pseudoperonospora cubensis (B. & C.) Rostow was reported in Delaware, South Carolina, Louisiana (3-5% loss due to leafspot and defoliation). In Oklahoma it was reported by Stratton as causing considerable loss after the October rains.

Mosaic (cause unknown) was serious in the vicinity of Gainesville, Florida, reducing the local production about half. Traces of mosaic were reported from Texas.

Powdery mildew caused by Erysiphe cichoracearum DC., Connecticut, Delaware; timber rot caused by Sclerotinia libertiana Fckl., New York; root knot caused by Heterodera radicicola (Greef) Müll. and wilt caused by Fusarium sp., Texas (loss from each, 2%).

WATERMELON

Anthracnose caused by Colletotrichum lagenarium (Pass.) E. & H.

This disease was one of the major causes of loss to watermelon growers in 1923, especially in those sections which experienced heavy rainfall during and just before the ripening period. Meier calls attention to the fact that in Florida the average yield per acre was reported as 175 melons as compared with 374 in 1920, 360 in 1921, and 380 in 1922; while Georgia produced an average yield of 178 melons as compared with 373 in 1920, 499 in 1921, and 310 in 1922. This reduction in yield in the two States was in large measure due to the epidemic of anthracnose, which in many fields caused complete loss. In these two States the average reduction in yield caused by this disease is estimated by Meier as 50 per cent. Moore of South Carolina reported an average reduction in yield of 30 per cent with total crop failure in some fields. Alabama, Mississippi, Louisiana, and Texas reported minor losses in the field. Losses in transit in the case of shipments from the above named states were caused by attempts to market badly pock-marked fruit. In Table 37, page 209, a summary of all Food Products Inspection records of melons shipped from four states in 1923, percentages of badly anthracnosed melons are given.

In Kansas the disease occurred as usual in the Kaw Valley, but was practically absent in the valley of the Republican River.

In New York and Delaware some difference was noted between varieties in the matter of susceptibility, the White Pearl, Irish Grey, and General Pershing being reported as very susceptible, while the long green varieties were somewhat resistant.

Meier reports that differences in susceptibility among the Irish Grey, Watson, Excell, and Rattlesnake varieties have not been evident in the commercial fields of the southern states.

Control of anthracnose by spraying with Bordeaux 4-4-50 was reported from South Carolina and from some sections in Florida. The best results were not obtained in the latter state, the prolonged rainfall preventing spray operations at the critical time. Good results were also secured in South Carolina by use of copper lime dust. Tehon of Illinois reported: "In Clark County only one field was able to withstand the attack, and this field had been planted with treated seed. It gave nearly $300 gross per acre as compared to neighboring fields, where $20 to $50 an acre was returned."

Stem-end rot caused by Diplodia sp.

With regard to stem-end rot, Meier reports as follows: "The decrease in stem-end rot, as shown by records issued by the Inspection Service on carloads of melons examined at terminal markets in 1923, is encouraging. (Table 37, page 209). As a matter of fact, inspection records have shown this transit disease to be on the decline since 1920, during which season the campaign for control, instituted by the Department of Agriculture and the Southeastern State Extension Services, was well under way. For example, in the carloads of Georgia melons inspected since that year, the following average percentages of melons with stem-end rot were found:

1920 ------	14.4%
1921 ------	8.3
1922 ------	6.2
1923 ------	3.2

In 1923, almost half of the stem-end rot found by inspectors in Georgia melons was located in six cars, each of which had 25 per cent or more of the load affected. The average for the remaining cars inspected was 1.7 per cent. A similar reduction in losses has been noted in the case of Florida shipments. This decrease of stem-end rot, as shown by inspection records, would seem to indicate a general reduction of this disease.

Since opportunities for field infection of melons have been fully as good if not better during the last five years than was the case in 1914, 1915, and 1916, when losses from the Southeast were so heavy as to constitute a real menace to the industry, it would seem that this improvement can safely be attributed to joint efforts at control by farmers, railroad men, and distributors. It seems probable that this trouble can be kept at a minimum if measures are continued to insure (1) careful handling during the harvesting and loading period in order to avoid wounds and knife cuts; (2) prompt shipment of freshly harvested melons, the stems of which have been reclipped, then treated with copper sulphate paste; (3) loading of melons relatively free from anthracnose pock-marks; and (4) the quickest possible railroad haul to distant markets.

Blossom-end rot (cause unknown)

This disease was reported as more destructive than usual in Delaware; about the same in Kentucky; Alabama, 2%; Texas, 2%; New Mexico, 2%; and less than usual in Indiana, Iowa, and Kansas (2%). The early planted fields of Delaware showed greater prevalence. Taubenhaus of Texas speaks of a loss of 2%, with the amount increased because of prolonged dry weather. Meier reports customary losses in Georgia and Florida, the Diplodia of stem-end rot as usual being frequently associated with this trouble.

Table 37. Analysis of records issued by Food Products Inspection Service on carloads of watermelons shipped from four States in 1923. (Meier)

		STEM-END ROT					ANTHRACNOSE			
	No. cars inspected	5% or over	10% or over	25% or over	Average per cent	Total number cars containing stem-end rot	5% or over	10% or over	25% or over	Average per cent
Georgia	128	28	11	6*	3.2	49	76	66	47	23.8
Florida	130	20	14	7**	3.5	43	99	91	71	35.9
Texas	22	12	6	2	7.5	18	3	2	0	1.6
South Carolina	10	3	1	0	3.2	6	3	1	1	7.0

* Almost half of stem-end rot loss due to 6 bad cars, each having 25% or more load affected. Average for other 122 cars was 1.7%.

** More than half of stem-end rot loss due to 7 bad cars, each having over 25% load affected. Average for other 123 cars was 1.6%.

Wilt caused by Fusarium niveum EFS.

Wilt in 1923 caused considerable damage in New Jersey and also in the central Mississippi Valley, Illinois, Iowa, Missouri and in the southwestern and western section of Texas, Arizona, New Mexico, and California. There was little complaint from Ohio, Indiana, Florida, Alabama, Mississippi and Kansas.

Table 38. Wilt losses and distribution in 1923.

State	Prevalence	Loss %	Notes
Md.	Same	Trace	
N. J.	In many fields	1-25	
N. C.	Minor		One specimen
Fla.	Minor		Scattered
Ala.	Minor		One report in Washington County.
Miss.	Minor		One report Lee County, Sept. 5.
La.	Slight	Same	May 30, Mansfield.
Tex.	Prevalent	10	
Ohio	Same	Slight	Sept. 14, Pleasant Plain. Prevents melon growing on large scale.
Ind.	Less		Low temperature unfavorable.
Ill.	Less	Major, 20%	July 24, Union County - most in river counties.
Iowa	More	Serious	Local in southeast Iowa.
Mo.	Moderate to heavy		Most in S. E. Mo. lowlands.
Kans.	Less	Important	Appeared later than usual.
N. M.	More	20%	July 6, Roswell, statewide. Many fields on sandy ground a failure.
Ariz.			June 8, Maricopa County. More after summer rains.
Calif.	Important	4%	Controlling factor many fields.

Other diseases

Downy mildew caused by Pseudoperonospora cubensis (B. & C.) Rostow was reported as less than last year in Delaware but caused very severe losses in late planted fields. In Louisiana it was present, but less troublesome than last year. It was noted for the first time on watermelon in California by Harter and Weimer. Milbrath says: "Downy mildew severe in coast regions of southern California. Loss in this section ranged from 15 to 70%." This report is understood to apply to both cantaloupe and watermelon.

Gummy stem blight or fruit rot caused by Mycosphaerella citrullina (C. O. Sm.) Gross. was reported as minor in New York, South Carolina, and Missouri. Moore, of South Carolina, says: "Gummy stem blight was general over the state. On Irish Grey melons it was found to cause a 20% loss; on other varieties no appreciable loss noted. Spraying with Bordeaux mixture held the disease in check but did not give a good control."

Powdery mildew caused by Erysiphe cichoracearum DC. (?) was reported by Higgins of Georgia as having spread from cantaloupes to watermelons, producing very serious loss throughout the state.

A mosaic-like trouble, cause unknown, was reported on a single plant in Houston, Kent County, Delaware and was also observed in Maryland.

Other diseases reported were leafspot caused by Phyllosticta citrullina Chester, Delaware, Florida; and by Cercospora citrullina Cke., Florida, Texas (loss 2%); *leaf blight* caused by *Macrosporium cucumerinum* Ell. & Ev., Delaware; *bacterial wilt* caused by *Bacillus tracheiphilus* EFS., Florida, Arizona; *root-knot* caused by *Heterodera radicicola* (Greef) Müll., Texas (prevalent), New Mexico (2% loss due to heavy infection on nearly mature plants), California (general and severe, loss 2%).

Hail injury, Kansas (caused 80-100% loss in the Garden City district of Pinney County, August 23); *frost injury*, Florida (destroyed plants in Sumter and Marion Counties, February 9; replanted); Georgia (March 22, damage 25%).

DISEASES OF CELERY

Late blight caused by *Septoria petroselini apii* Br. & Cav.

This disease seemed to be much less prevalent in 1923 than in the previous year except in Michigan, where it developed following September rains. This was attributed to the extensive drought which was more or less general.

Massachusetts: Appeared about July 1. General but not serious. Too dry for extensive development. (Osmun)

Connecticut: Less. Appeared September 29 at Wethersfield. Chiefly on self blanching varieties - Paris Golden, Golden Self Blanching. Thorough repeated spraying with Bordeaux will, in my opinion, largely control this trouble even on the susceptible varieties. (Clinton)

New York: Always important. Loss 3 to 7%. Appeared June 13, Tompkins County. (Chupp)

New Jersey: The late blight disease was not serious this year. It caused slight loss in irrigated fields, where infection occurred in isolated areas. (Poole)

Pennsylvania: General; Golden Self-blanching the most susceptible variety (Nixon)

Delaware: Very little of the disease found this season; it was the most important disease of celery last year. (Adams)

Ohio: Where celery is grown in continuous culture gardeners find it well worth while to spray because this disease may be expected every year. (R. C. Thomas)

Illinois: Slight except under overhead irrigation. Loss a trace. (Tehor

Michigan: Very destructive; reduction in yield 50%, 100% loss to last cr around Kalamazoo. Epidemic began in early September following extremely wet weather. Spraying fairly successful. (Coons)

California: Blight very severe in Sacramento Valley, and Los Angeles and San Diego Counties. Loss about 4% in state. (Milbrath)

Other states reporting the presence of the disease, mostly in slight amounts, are New Hampshire, Florida, Minnesota, Colorado, and Washington.

Recent literature

Coons, G. H. Celery blight or leafspot. Quart. Bul. Michigan Agr. Exp. Sta. 5: 190-193. May 1923.

Early blight caused by Cercospora apii Fr.

Early blight was noted in New Hampshire, Massachusetts, Connecticut, New York, New Jersey, Delaware, Florida, Texas, Ohio, Indiana, Michigan, and Missouri. It was of little economic importance except in Delaware where Adams says it was the most important disease of the crop. Fordhook and Golden Self-blanching were severely attacked. Winter King was slightly attacked in Indiana where Gardner said the disease killed the outer leaves, and in Florida. In New Jersey the disease occurred in artificially watered fields and in Missouri in unsprayed fields. Weber, of Florida, says this is one of the most serious diseases of celery in the state, and is not being effectively controlled in the field. Wet Bordeaux mixture has given better control than the dust unless the latter was applied in such large amounts as to make its cost prohibitive. The severity of early blight in Florida was associated with the particulary warm weather during the early growing season.

Yellows caused by Fusarium sp.

This disease was reported from New York as common in Wayne, Monroe and Livingston Counties. In Ohio it was serious in some truck sections. As expected from the weather records there was less celery yellows in Indiana than usual owing to the rains and lower temperature. The soil around Goshen, LaFayette, and Indianapolis is becoming infected. Two new locations at Hudsonville and Holland were noted by Coons in Michigan. Yellows was also noted in Minnesota and Colorado. The Golden Self-blanching variety was reported most susceptible in New York and Indiana.

Other diseases

Black heart, cause unknown, is reported by Weber as one of the most serious and baffling celery diseases of Florida. It was very serious at Sanford, causing the total loss of several fields of 5 to 15 acres. In most cases it showed up rather late. It sometimes created an entrance for slimy or watery soft rot.

Damping-off caused by several fungi, chiefly Pythium and Rhizoctonia, caused considerable damage in seed beds near Bradentown and Sanford, Florida. Losses ranged from 5 to 40%.

Soft rot caused by B. carotovorus Jones was reported in New Jersey as less destructive than for the past five years. The dry weather in the growing season was the biggest factor in its control. Soft rot was also reported in Ohio and Washington.

Root-knot caused by Heterodera radicicola (Greef) Müll. was reported as present in New York and Michigan and as more than usually severe in Florida. Foster located nematode galls August 20 at Sanford, Florida and said on September 15, 1923:

> "It is almost impossible to find a seed bed that has not a certain degree of nematodes present and in some instances every plant is affected. So far, not a single grower has adopted any of the preventive measures to control nematodes."

Bacterial blight caused by Bacterium apii Jagger, New York, Michigan; Sclerotinia libertiana Fckl. causing watery soft rot, New York (common in storage houses, loss 2 to 5%), causing pink rot of roots, Florida; mosaic, cause unknown, New York (Tompkins County), California (Delta region); reddening due to low temperature, Washington; stem cracking, cause unknown, Michigan (Manchester, very severe).

DISEASES OF LETTUCE

Drop caused by Sclerotinia libertiniana Fckl.

This disease is common in greenhouse lettuce in the northeastern and central states and sometimes causes serious damage. In the South, where it occurs in the field crop, it is considered very serious. In Florida, Weber reports at Sanford 30% loss, Orlando 20%, Oakland 35%, Ellenton 15%, Gainesville, 15%, Palatka 20%, and Quincy 15-20% loss. Other states reporting lettuce drop are Massachusetts, Connecticut, New York, New Jersey, Pennsylvania, Delaware, North Carolina, Florida, Ohio, Indiana, Illinois, Minnesota, New Mexico and South Carolina.

Recent literature

Krout, W. S. Control of lettuce drop by the use of formaldehyde. Jour. Agr. Res. 23: 645-654. Feb. 24, 1923.

Beach, W. S. Some new methods and results in the control of lettuce diseases with formaldehyde. (Abstract) Phytopath. 14: 28-29. 1924.

Downy mildew caused by Bremia lactucae Regel

Downy mildew was reported as about the same or less than usual from Massachusetts, New York, Florida, Ohio, Indiana, Illinois, Iowa, Colorado, and

California. In Massachusetts, Ohio, Indiana, Illinois, and Iowa it is a greenhouse disease only. Losses are reduced to a minimum because of the use of modern greenhouse construction, which renders ventilation easy and satisfactory. The disease is an important problem, both in the field and in transportation, in California, according to Milbrath (2).

Chupp, of New York, reports mildew worse on crisp types such as hybrids and Iceberg.. In California Iceberg is said to be resistant. According to Milbrath (2) and Jagger (1) the variety New York or Los Angeles Market, largely planted in California, is frequently called Iceberg in eastern markets. This variety is very susceptible to downy mildew, whereas the true Iceberg is highly resistant, but is also much inferior in quality.

In Florida the fungus was found on the wild cudweed which undoubtedly plays an important role in harboring the fungus where lettuce is not in cultivation.

Milbrath (2) states that he has observed zoospore production which had not been recorded for Bremia lactucae previously.

Recent literature

1. Jagger, Ivan C. Immunity to mildew (Brĕmia lactucae Reg.) and its inheritance in lettuce. (Abstract) Phytopath. 14: 122. Feb. 1924.

2. Milbrath, D. G. Downy mildew on lettuce in California. Jour. Agr. Res. 23: 989-994. 1923.

Grey mold caused by Botrytis cinerea Pers.

This is reported as a greenhouse trouble in Connecticut, New York, Pennsylvania, Ohio, Minnesota, Iowa, and Washington. It is not usually destructive where humidity and temperature are under control. Thomas, of Ohio, says: "The third crop of lettuce of the winter season is generally most seriously affected." In New York, North and South Carolina, and Washington grey mold is also reported as a disease found in the field. Ludwig, of South Carolina, reports: "Serious epidemic in the Beaufort lettuce producing district following a freeze which occurred when the lettuce was nearly headed. Later maturing part of the crop was less affected." Probable loss in South Carolina, 5%, North Carolina 3%, Minnesota 5%, New York trace. Heald, of Washington, says grey mold is much worse in the cloudy weather of early spring.

Bacterial diseases

Rosette disease caused by Aplanobacter rhizoctonia Thomas was reported as more or less general in Ohio and present in greenhouses in Tompkins County, New York.

Soft rot or leaf rot caused by Bacillus carotovorus Jones was reported as minor in Connecticut but becoming more important each year in Idaho. A leaf-spot thought to be caused by undetermined bacteria was reported by Weber of

Florida. Weber also reported black rot caused by Bacterium sp. as one of the worst lettuce diseases of the state. The damage reported was: Oakland, 1-3%; Orlando, 4%; Gainesville, 5%; Micanopy, a ten acre field with over 90% loss.

Edgerton, of Louisiana, reported: "Bacterial rots are common as usual. Lettuce that was not off before the warm weather was quite severely injured."

J. T. Rosa observed near Salinas and Watsonville, California a large amount of bacterial slime which in many cases caused complete loss of the crop, June, July, and August. The land had never before been planted to lettuce.

Recent literature

Smith, R. E. and E. H. Smith. Bacterial slime disease of lettuce. (Abstract). Phytopath. 14: 122. Feb. 1924.

Bottom rot caused by Rhizoctonia sp.

This disease was reported from greenhouses in Ohio, Indiana, and Illinois; in the fields of Wayne County, New York. It was less serious than usual in New York and more so than usual in greenhouses in Ohio. The rosette type of the disease caused by Rhizoctonia was common in seed beds in Ohio. It was also reported as serious in the Station greenhouses at Urbana, Illinois.

Tip burn (non-parasitic)

The tip burn trouble in lettuce was more severe than usual last year, causing a 25 to 30% loss in New York and 20% in North Carolina. It has been found most severe following exceptionally hot days and on soil that has been heavily fertilized, especially with nitrate of soda. It was also noted in Idaho and California.

Other diseases

Rio Grande disease, cause unknown, was reported as a trace from Texas. A disease of similar appearance was reported by Chupp of New York as very common and probably caused by insects, of which the tarnished plant bug is most important.

Stunt caused by Pythium sp. was fairly prevalent in New York in June, but disappeared with advent of dry weather. Stunting of the plants in Indiana is attributed to excess of soluble salts in the soil.

Leafspots caused by Septoria spp. were reported as follows: S. consimilis E. & M., New York (worse on certain hybrids - Cos X Boston; quite severe in the seed plots); S. lactucae Pass., North Carolina, Illinois, (infection followed in moist periods by rots which considerably reduce the sale value of the crop); species undetermined, Delaware.

A new leafspot is described from the Philippine Islands by Welles as due to Cercospora lactucae.

Anthracnose caused by Marssonina panattoniana (Berl.) Magnus, Florida;

leafspot caused by Phyllosticta sp., South Carolina; black mold caused by Macrosporium cladosporioides Desm., Florida; rust caused by Aecidium sp., Minnesota (reported from the same state in 1912 also); root rot caused by Ozonium omnivorum Shear, Texas; root knot caused by Heterodera radicicola (Greef) Müll., in greenhouses in Ohio (serious; difficult to control), and Indiana (serious in one greenhouse); slimy rot, cause undetermined, South Carolina (appearance of plants suggested grey mold but no sclerotia were present or produced in damp chamber); mosaic, cause unknown, New York, New Mexico (common and very important on the winter crop); chlorosis caused by too much lime in the soil, Texas.

Frosts which occurred on several occasions in January and March did more or less damage to the early crop in Florida, Texas and California. It is thought that the chilled leaves offered a favorable entrance for many fungi associated with rots.

Recent literature

1. Newhall, A. G. Seed transmission of lettuce mosaic. Phytopath. 13: 104-106. Feb. 1923.

2. Salmon, E. S. and H. Wormald. The "ring spot" and "rust" disease of lettuce. Jour. Min. Agr. Gt. Brit. 30: 147-151. May 1923.

3. Welles, Colin G. Leafspot of lettuce. Phytopath. 13: 289. 1923.
A new leafspot of lettuce produced by a species of Cercospora tentatively designated Cercospora lactucae n. sp. reported from Phillipine Islands.

DISEASES OF PEA

Pea diseases in general were very much less destructive in 1923 than in 1922.

Root rot caused by various fungi

Several fungi, including Fusarium sp., Pythium debaryanum Hesse, Rhizoctonia solani Kuhn, Aphanomyces sp., and Thielavia basicola (B. & Br.) Zopf., are reported as causing root rot of peas..

Connecticut: Thielavia, Rhizoctonia and Pythium reported; severe locally. (Clinton)

Massachusetts: Rhizoctonia and Fusarium general as usual. (Osmun)

New York: Pythium and Rhizoctonia important locally where there is lack of rotation or drainage. Not likely to be serious in carefully managed fields. (Chupp)

New Jersey: Losses average 25%; same as usual in Camden and Burlington Counties, and increasing in Cumberland County, especially on light soils. Some fields on heavy soil practically free from rot. Great reduction in canning acreage due to root rot and aphids. (Poole)

Delaware: Less prevalent and of little importance this year. Loss 5%. (Adams)

Maryland: About same as usual or more. Strains of Early Alaska selected for resistance appear promising. (Temple)

Florida: Pythium caused considerable loss near Palm Beach and Interlachen. The loss in a field near Micanopy amounted to 90% of the stand. (Weber)

Ohio: Numerous cases of a type of root rot apparently seed-borne. Losses vary from 5 to 30%. (Thomas)

Wisconsin: Aphanomyces sp. and others. Much less loss than last year, associated with low rainfall and high temperature. More in eastern section where rains occurred. (Vaughan)

Utah: Rhizoctonia, Pythium, and Aphanomyces especially severe in Morgan and Weber Counties. Also found in Utah, Davis, Boxelder, and Salt Lake Counties. Relative importance of fungi not clear, Aphanonyces may rank first. (Richards)

The Fusarium which causes root rot of peas is described by F. R. Jones (1) as F. martii pisi, n. var. The variety is widely distributed in pea-growing sections in this country, but is less important than Aphanomyces sp. as a cause of loss. The development of the disease is favored by temperature above 18°C., but variations in the soil moisture content within limits favorable for the growth of the host apparently do not affect it.

Recent literature

Cited

1. Jones, Fred. Reuel. Stem and root rot of peas in the United States caused by species of Fusarium. Jour. Agr. Res. 26: 459-475. Dec. 8, 1923.

Not Cited

Richards, B. L. Soil temperature as a factor affecting the pathogenicity of Corticium vagum on the pea and the bean. Jour. Agr. Res. 25: 431-450. Sept. 15, 1923.

Stone, R. E. Root rot and blight of canning peas. (Abstract). Phytopath. 13: 293. 1923.

Other diseases

Blight or pod spot caused by Mycosphaerella pinodes Berk. & Blox. was reported from New York, North and South Carolina, Alabama, Wisconsin, and California. It apparently was unimportant except in the coast regions of the last-named state, where the loss was estimated by Milbrath as 6%.

Powdery mildew caused by Erysiphe polygoni DC. was the most serious disease of peas in Florida, according to Weber (reported as Oidium balsamii Mont.). In two fields of 10 and 23 acres near Micanopy the loss was 70%, and similar losses occurred in smaller fields also. In other states reporting powdery mildew it was confined to late-planted peas and was of minor importance, except locally in Alabama, where it caused 5% loss, and California, where it was severe in San Diego County and was only prevented from causing large losses by constant sulfuring. In addition to the states already mentioned, powdery mildew was reported from Connecticut, New York, Colorado, Utah, and Washington.

Bacterial blight caused by Bacterium pisi (Sackett) EFS. occurred in Indiana greenhouses where it was apparently introduced with the seed. It was less important than usual in Wisconsin and more so in Minnesota. Milbrath reported it as very severe and causing losses ranging from 2 to 15% in San Mateo and Santa Clara Counties, California.

Black leaf, caused by Fusicladium sp. and Phyllosticta sp., was reported from Utah for the first time. It was abundant in Cache and Morgan Counties, but is not usually important as it appears late in the growing season.

Downy mildew caused by Peronospora viciae Berk., Florida (widespread on young plants after they had been injured by frost), Wisconsin, California; black mold caused by Alternaria sp. Florida (serious near Gainesville, attacking both pods and vines, and resulting in 20% loss); leafspot caused by Septoria pisi West., Delaware, Wisconsin; mosaic, cause unknown, California (caused severe loss in Salinas Valley during July); rough pods or intumescences, cause unknown, Washington.

Frost did considerable damage to the winter crop both in Florida and California. Drought caused dwarfing and resulting short crop in Wisconsin. Scald due to extremely high temperatures in mid-June caused considerable loss in Ohio.

DISEASES OF COTTON

Anthracnose caused by Glomerella gossypii (S.) Edg.

Anthracnose was more prevalent in 1923 than for several seasons in Alabama (5%), Mississippi (4%), and Louisiana (5-8%). This increased amount of anthracnose was evidently associated with an excessive rainfall in the states named. About the same amount as usual occurred in North Carolina (4%), South Carolina (1%), Florida, Texas (1%), and Arkansas (1%). Miles reports that in certain fields in the northern part of Alabama 80% of the bolls rotted. Fant, of North Carolina, considers the general reduction of losses from this disease over those occurring 10 to 15 years ago as due to the introduction of new and improved strains of cotton. It has been suggested that two factors may be involved in this reduction, namely, the resistance of the new strains to anthracnose, and the fact that greater freedom from disease has been secured through selection in the process of improvement.

Dates of first appearance are: April 27, Charleston, South Carolina; April 30, Washington County, Mississippi; and May 3, Baton Rouge, Louisiana.

Recent literature

Lipscomb, G. F. and G. L. Corley. On the vitality of cotton seed. Science 57: 741-742. June 29, 1923.

"We have found that by thoroughly drying and heating cotton seed in a vacuum ......to prevent oxidation of the fats and proteins in the seed they will endure the temperature of boiling water for hours without affecting their vitality. This treatment has completely destroyed the fungus anthracnose. Very highly infected seed of the Weber 49 variety was used in all experiments."

________________ A new treatment of cotton seed to destroy anthracnose. Amer. Fert. 18: 32-34. 1923.

Ludwig, C. A. Studies of anthracnose infection in cotton seed. (Abstract) Phytopath. 14: 52. Jan. 1924. Anthracnose infected cotton seed gradually becomes clean after being stored for a considerable time. It is safe to use the third spring after gathering. The greatest reduction in infection occurs during the autumn when the seed is about a year old.

Wilt caused by Fusarium vasinfectum Atk.

Wilt was more prevalent than usual in Arkansas (5% loss), and Louisiana (severe). The reduction in yield in other states was about the same as usual. North Carolina (3%), South Carolina (2%), Florida (worst disease), Alabama (3%), Mississippi (3%), and Texas (2%). The dates of earliest appearance reported are June 20, Pitt County, North Carolina; June 28, Oktibbeha County, Mississippi; July 2, Los Cruces, New Mexico; July 10, Oconee, South Carolina; and July 11, Montgomery, Louisiana. In several cases it is noted as more severe on light soils than bottom lands. In South Carolina wilt is actively invading the Piedmont, where it is new; and in North Carolina also it is gradually becoming more abundant, according to collaborators. Miles reports losses in one field as high as 75%. Young, of Arkansas, says there is often sufficient recovery to permit an average number of bolls to mature. Neal and Barker of Mississippi, list the following resistant varieties: Delta 6102 and Express 350, also Sealsbury, fairly resistant among long staple. Lewis 63, Tri-Cook, Miller, Covington-Toole, Acala 5, resistant short staple. Fant, of North Carolina, notes that Dixie-Triumph is highly wilt resistant and has the added advantage of being of value for growing under boll weevil conditions and that many farmers are planting this variety exclusively.

Recent literature

Elliott, J. A. Cotton wilt, a seed-borne disease. Jour. Agr. Res. 23: 387-393. 1923.

Angular leafspot caused by Bacterium malvacearum EFS.

Angular leafspot continues to be one of the widespread diseases of cotton.

In general, it was about as prevalent in 1923 as in previous years, with the exception of South Carolina where there was more on the Coastal Plain, and Texas where the greatest damage was done early. The late summer drought seemed to check the disease.

The losses from and distribution of the disease are given in the following table. The report from Illinois is of particular interest. According to Tehon, "Cotton growing is undergoing a great boom in southern Illinois with an estimated prospect of 12,000 acres in 1924. Angular leafspot has caused minor damage thus far."

Table 39. Cotton angular leafspot losses and occurrence

State	Loss %	Earliest date	State	Loss %	Earliest date
N. C.	1		La.	same	July 10
S. C.	5	July 7	Tex.	9	
Ga.	same	June 24	Ark.	5	
Fla.	2		Mo.	present	
Ala.	1		Ariz.	heavy	Mar. 30
Miss.	same	June 15	Ill.	present	July 26

Brown and Gibson (1) have successfully inoculated the Arizona wild cotton (Thurberia thespesioides) with the angular leafspot organism.

Recent literature

1. Brown, J. G. and Frederick Gibson. A new host for Bacterium malvacearum. Phytopath. 13: 455-457. Oct. 1923.

Root rot caused by Ozonium omnivorum Shear
(Phymalotrichum omnivorum (Shear) Duggar)

Root rot was reported from approximately the same areas in Texas and Arizona as in 1922. Taubenhaus estimates a 12% loss in the black lands. Brown, of Arizona, says: "Loss reported as 4% in Yuma County amounting to 800 acres. Less serious in Maricopa and Pima Counties. It was not reported until late in the season, i. e. August 15-20. The late appearance was probably due to climatic conditions."

Recent literature

King, C. J. Cotton root rot in Arizona. Jour. Agr. Res. 23: 525-527. 1923.

"Ozonium omnivorum fruits abundantly at Sacaton, Arizona. The fungus spreads in a "fairy ring" and the fruiting bodies are found abundantly on moist soil at the margin of the ring. A felt-like mat is formed 15-25 cm. outside the outer circle of recently wilted plants. Cotton plants were infected by placing diseased roots beside healthy ones and also by inoculation with mycelium from pure culture. Spores are germinated with difficulty and have not been used successfully as a medium of infection. Progress of the rings has been stopped by saturating the soil at the periphery of the ring with 1 part commercial (40 per cent) formaldehyde to 100 parts water. In alfalfa fields the zone of disinfection must be about 75 cm. outside the line of wilted plants and in cotton fields 150 cm. D. Reddick. (Bot. Absts.)

Taubenhaus, J. J. and D. T. Killough. Texas root rot of cotton and methods of its control. Texas Agr. Exper. Sta. Bul. 307: 1-98. Apr. 1923.

Root knot caused by Heterodera radicicola (Greef) Müll.

Root knot caused a reduction in yield in North Carolina of 2%, Alabama trace, Mississippi trace, Texas 1%, Arkansas 2%, New Mexico 2%. Miles says that it was more general in Alabama than is commonly assumed. Cotton suffers severely on some of the light, sandy soils. Neal and Barker note that a heavy local infection of nematodes in Pearl River County, Mississippi was adjacent to an infested peach orchard.

Other diseases

Damping-off or sore shin due to Rhizoctonia sp. was reported from Georgia, Florida, and Arizona as more serious than usual owing to wet weather in the early part of the season. Weber, of Florida, states:

> "In a large number of fields in Columbia and Alachua Counties the stand was reduced 30-60%. A forty acre field in Columbia county was a total loss. Near Gainesville several fields showed 50% loss in killed seedlings. Replanting was carried on in most fields in the cotton growing section."

Leafspot caused by Ascochyta gossypii Sydow was collected at Clemson College, South Carolina. This disease has only been reported heretofore from Arkansas.

Black rust caused by Macrosporium nigricantium Atk. was reported as worse than ever before known in South Carolina. It was more prevalent in the eastern than western sections, and caused a loss estimated at 2%. It was first observed August 30 at Chester. Moore states that black rust was found on soil previously in alfalfa. It was also reported from Florida.

Boll rot caused by Diplodia gossypina Cke. was reported as more serious than usual in South Carolina and Arkansas. Its occurrence was associated with extremely wet weather.

Fertilizer injury caused by excessive use of sodium nitrate resulted in a parched and leathery condition of the leaves; reported by Neal and Barker of Mississippi.

Other diseases and injuries reported were leafspot caused by Cercospora gossypina Cke., South Carolina, Florida, Texas, and Oklahoma (Mycosphaerella stage) probably occurred in every cotton growing state; rust caused by Puccinia hibisciata (Schw.) Kellerm. (Aecidium gossypii Ell. & Ev.), Texas (0.5% loss in the Rio Grande Valley), Arizona; boll rot caused by Olpitrichum carpophilum Atk., Louisiana; albino plants, New Mexico (a few plants of one variety showed this condition, the cause for which is unknown); lightning injury, South Carolina; poor stands due to damping-off favored by cold damp weather in early spring, Arkansas.

Recent literature

Ballard, E. and Dorothy Norris. Bacterial infection of cotton bolls. Agr. Jour. India 18: 40-49. Jan. 1923.

Disease due to a bacterium which is not B. malvacearum; insects appear to play a large part in the dissemination of the disease.

Crawford, R. F. Fungi isolated from the interior of cotton seed. Phytopath. 13: 501-503. Nov. 1923.

Skinner, J. J. and F. E. Allison. Influence of fertilizers containing borax on the growth and fruiting of cotton. Jour. Agr. Res. 23: 433-443. 1923.

DISEASES OF SUGAR CANE

(Prepared by E. W. Brandes)

Mosaic (cause undetermined)

Mosaic continues to attract attention in the cane producing sections of Louisiana, Georgia, Florida, Mississippi, Porto Rico, and Philippine Islands. It has now been reported from practically every cane producing region of the world. This disease is not considered as dangerous as it was a few years ago, since marked progress has been made in securing highly resistant or immune varieties or strains. Edgerton, of Louisiana, estimates a reduction of five to ten per cent in cane yield because of mosaic. Weber, of Florida, reports that the State Plant Board is directing the growing of a variety of sugar cane of the Uba type, "Cayana-10", which was supplied by the U. S. Department of Agriculture. This variety is immune to mosaic. At the present rate of progress the disease will be eliminated from the state in a few years.

The Office of Sugar-Plant Investigations, Bureau of Plant Industry, undertook a thorough exploration of the Orient during the winter of 1922-23 for the purpose of securing varieties immune to mosaic. Varieties in which no infection was found were located in Formosa, the Philippines and Java. These are being tested this year in Louisiana and Florida and are also being used for crossing with our established varieties. The breeding work is being carried on at the Sugar Cane Field Station of the Department of Agriculture at Canal Point, Florida.

Recent literature

1. Weber, G. F. Field work in Florida during the year on disease control. The Quar. Bul. of the St. Pl. Bd. of Florida 8 (1): 1-8. Oct. 1923.

2. Sample, D. M. Mosaic disease causes heavy losses. Sugar Centr. and Plant News 4: 140. Mar. 1923.

3. Hind, R. Renton. Toledo cane, a mosaic immune variety. Sugar Centr. & Plant News 4: 105-107, 110, 137-138. 1923.

4. Anon. New canes immune to mosaic. Facts about Sugar 16: 314. Apr. 21, 1923.

Not Cited

Barber, C. A. On insect transmission of mosaic, especially in Java. Intern. Sugar Jour. 25: 346-351. July 1923.

Brandes, E. W. Mechanics of inoculation with sugar-cane mosaic by insects vectors. Jour. Agr. Res. 23: 273-283. 1923. Literature cited: p. 283

Brandes, E. W., and Peter J. Klaphaak. Cultivated and wild hosts of sugar cane or grass mosaic. Jour. Agr. Res. 24: 247-262. 1923. About 40 species of Gramineae have been tested and the following are definitely susceptible to mosaic: Saccharum officinarum, Zea mays, Holcus sorghum, Pennisetum glaucum, Miscanthus sinensis, Saccharum narenga, Paspalum boscianum, Syntherisma sanguinalis, Chaetochloa lutescens, C. magna, Echinochloa crusgalli, Panicum dichotomiflorum, Brachiaria platyphylla. Several varieties of the slender North India type of sugar cane reputed to be immune, have been found susceptible to the disease but exhibit suppressed symptoms. Many varieties of maize when tested in southern fields proved susceptible but some are more so than others. Northern and Western varieties, which did not make a good growth, did not show the disease. Southern varieties of maize showed reduction in yield varying from 0.4 to 50 per cent on account of the disease. Aphis maidis is the only insect vector noted. Tests for seed transmission gave negative results. (D. Reddick. Bot. Absts. Abstract)

____________________________________ Growth stimulation pest and disease control by hot wqter treatment of sugar cane "seed"- I. Louisiana Planter 71: 371-372. Nov. 10, 1923.

Data on disease control not available for preliminary report, except that hot water treatment has failed to eliminate mosaic.

Brunner, Stephen C. Mosaic and other cane diseases and pests in Cuba. Louisiana Planter 70: 452-455. The mosaic disease of sugar cane is present in many localities in Cuba but it does not seem to be spreading as rapidly nor doing as much damage as in some other countries like Porto Rico. The Crystalina cane, the variety which is largely grown in Cuba, is more resistant than many varieties. It is believed that the disease is not a menace to the Cuban sugar industry and that it can be controlled satisfactorily with immune and resistant varieties. Other cane diseases are mentioned very briefly. (C. W. Edgerton, Bot. Absts.)

Chardon, C. E. Report of the special pathologist, 1921-1922. Ann. Rep. Insular Exp. Stat. Porto Rico 1921-1922. Investigations on sugar mosaic.

____________ and R. A. Veve. The transmission of sugar cane mosaic by Aphis maidis under field conditions in Porto Rico. Phytopath. 13: 24-29. 1923.

Earle, F. S. Experiences with mosaic disease. Uba found to be immune in Cuba. South African Sugar Jour. 7: 427-428. 1923.

____________ Mosaic disease danger. Prompt action needed to stop its spread in Cuba. Facts About Sugar 16: 230-231. 1923. The mosaic disease of sugar cane is spreading rapidly in Cuba and very little is being done to control it. In Porto Rice, the disease is being controlled by seed selection and rogueing. (C. W. Edgerton, Bot. Absts.)

Matz, Julius. Naturaleza mosaico de la cana. (Nature of cane mosaic.) Sugar 25: 222-223. This is a discussion of the bodies found in the tissues of mosaic affected plants. (C. W. Edgerton, Bot. Absts.)

____________ Recent developments in the study of the nature of mosaic diseases of sugar cane and other plants. Jour. Dept. Agr. Porto Rico 63: 22-27. July 1922.

Page, R. L. Mosaic disease: its eradication and control. Facts About Sugar. 17: 14-15. July 7, 1923.

Root disease

Root disease (cause not determined) continues to cause considerable losses throughout the South. It is generally considered as responsible for the failure of second stubble crops and partial failure of first stubble crops in Louisiana and Georgia. (Brandes)

Seed cane deterioration

Deterioration of seed cane in windrows and banks was reported as especially destructive in southern Georgia. Numerous fungi and bacteria, among them Colletotrichum falcatum Went. and Thielaviopsis paradoxa (De Seyn) von Höhn. were isolated from the rotting cane. It was noted in Georgia that varieties of the Uba type were more severely injured than the Purple and Ribbon varieties. In Louisiana the prevalence of this type of injury and damage caused by it appeared to be greater than in the previous two years.

Other diseases

Red rot caused by Colletotrichum falcatum Went was reported as more than usual in Louisiana, loss 3 per cent, common and causing heavy losses in Florida, and only observed twice in Alabama. Edgerton, of Louisiana states that red rot was favored by a heavy borer infestation and wet weather.

Reference

Sahasrabuddhe, D. L. Investigations on the causes favoring the development of red rot of sugar cane in Gujarat. Poona Agr. Coll. Rep. No. 18. 16 p. 1922.

Leaf spot caused by Helminthosporium sacchari But. was reported as common in Porto Rico.

Rind disease caused by Melanconium sacchari Massee was reported as very slight in Louisiana but severe in Porto Rico. It was observed once by a quarantine inspector at Key West.

Leaf spot caused by Phyllosticta sacchari Speg. was reported from Porto Rico.

Dry top rot caused by Plasmodiophora vascularum Matz was reported in the roots and lower part of the cane in Porto Rico.

Reference

Matz, Julius. Dry top rot of sugar cane. A vascular disease. Jour. Dept. Agr. Porto Rico 63: 28-47. July 1923.
Most serious as far as yield is concerned, of three or four major cane diseases in Porto Rico.

Gumming disease caused by Bacterium vascularum EFS. was reported by Cook and Toro as very severe in Porto Rico.

Reference

Matz, Julius. Gumming disease of sugar cane. Jour. Dept. Agr. Porto Rico 63: 5-21. July 1922.

Recent literature

Cook, Mel. T. Root diseases of sugar cane in Porto Rico. (Abstract). Phytopath. 14: 59 Jan. 1924.

Earle, F. S. Sugar cane root disease. A neglected enemy of cane and ways of controlling it. Facts About Sugar 16: 314. Apr. 21, 1923.

Lee, Henry Atherton. Sereh disease of sugar cane in Singapore. Phytopath. 13: 145. Mar. 1923.

McWhorter, Frank P. The nature of the organism found in the Fiji galls of sugar cane. Louisiana Planter 70: 148-150. 1923. Reproduced from the Philippine Agriculturist (see Bot. Absts. 12, Entry 2644).

________________ Cause and control of Fiji disease. Sugar Centr. & Plant News. 4: 385-389. Aug. 1923.

Tyron, H. Top rot of the sugar cane. An inquiry into the nature and origin of a disease affecting sugar cane in the Herbert River and other districts of Queensland. Queensland Bureau of Sugar Experiment Stations: Div. of Path. Bul. 1. 56 pp. 1923.

Lee, H. A. Gum diseases of sugar cane in the Philippines. Phytopath. 13: 504. Nov. 1923.

DISEASES OF SUGAR BEET

Leafspot caused by *Cercospora beticola* Sacc.

While leafspot was of widespread occurrence the losses resulting were probably negligible, except for certain sections such as the Arkansas Valley in Colorado. Thomas, of Ohio, says it is the most prevalent disease seen. Coons, of Michigan, says that the epidemic which was considered ready to break on July 15 was checked in early August by cool moderately moist weather. Stokdyk, of Kansas, quotes Mr. Gillespie of the Garden City Sugar Company who "believes late planting is the practical control. Beets seem to escape the attack when planted late." Richards, of Utah, says: "Leafspot cannot be considered as a serious factor in the state at present. The amount of damage in some fields, together with the possibility of spread, indicates trouble for the future." A severe general infestation of leafspot in the Arkansas Valley of Colorado was recorded by Mr. Skuderna, Experimentalist for the American Sugar Company. This disease is regarded there as a serious problem. Mr. Skuderna reports a variety of beet practically immune to *Cercospora beticola*. Mr. Eubanks Carsner, of the Office of Sugar Plant Investigations states that in the vicinity of Santa Ana, California a considerable amount of damage resulted late in the season from an epidemic of leafspot.

Recent literature

Takimoto, Kyosumi. On the vitality of *Cercospora beticola*. Ann. Phytopath. Soc. Japan 1: 43-44. 1923. English summary: p. 44.

"1. The spores of *Cercospora beticola* kept in dry condition at the laboratory were active for 16 months.

2. The spores infected in the seeds were able to germinate until the end of April (sowing season) of next year.

3. The spores of diseased leaves kept under caves were not able to germinate in the beginning of May, but sclerotial bodies or mycelia in tissue were alive through the winter.

4. The spores of diseased leaves placed on the soil in the fields of Suwon, lose their vitality in the beginning of May but the sclerotial bodies of mycelia in the tissue were very often able to germinate. The same result was obtained at Keijo, but a few spores on the under parts of the pile were able to germinate in the case where beet root were covered with thin layer of soil.

5. The spores of diseased leaves mixed with the wet soil died after 3 to 4 weeks, in the laboratory.

Curly-top (cause not determined)

Curly-top of sugar beets was reported by Crawford as the limiting factor in producing beets in New Mexico. He estimated that every field in the state showed the disease and placed the reduction in yield at 40%. However, the acreage planted to sugar beets in New Mexico is not large. Hungerford says curly-top was important in Idaho and reduced the yield 4%. In California the loss due to curly-top was estimated as 5.4% by Mr. Rittue, of the Office of Sugar Plant Investigations, Bureau of Plant Industry. Dr. Pack of the same office reports only moderate losses this year in Utah. Mr. Eubanks Carsner, also of this office, makes the following statement:

> "The beet leafhoppers seemed at a relatively low ebb in 1923 so that relative to other years the damage from curly-top was decreased. This applies to California only. In the Salinas Valley of California in the area around King City two small fields which were planted in March were completely ruined by curly-top while the later plantings were only moderately damaged. Usually the late planted fields in this district are badly affected. In the Sacramento Valley a very good crop of beets was raised and the damage from curly-top was much less than in many other years.
>
> "In the states other than California we have no authentic reports except from the Yakima Valley of Washington. There the curly-top damage was very serious. No complaint was heard from Utah or southern Idaho and presumably, therefore, the damage was less severe there than in some previous seasons."

Recent literature

Boncquet, P. A. Discovery of curly leaf of sugar beets in the Argentine Republic. Phytopath. 13: 458-460. Oct. 1923

Carsner, Eubanks and C. F. Stahl. The relation of Chenopodium murale to curly-top of the sugar beet. (Abstract) Phytopath. 14: 57. Jan. 1924.

"Many of the beet leafhoppers which come into the beet fields in spring are non-viriferous. Chenopodium murale is one of this insects' winter host plants. Inoculations have shown that this plant is very resistant to curly-top. Tests with nymphs reared on this plant from viriferous parents have indicated that usually the virus of curly-top is so attenuated by its passage through this resistant plant that it subsequently fails to cause the disease or else produces only mild cases. It seems probable that the non-viriferous leafhoppers which enter the beet fields in spring come from Chenopodium murale or plants comparable to it in relation to curly-top. Studies are in progress to determine whether or not attenuated virus can be reactivated."

Carsner, Eubanks and C. F. Stahl. Progress report on curly-top of the sugar beet (Abstract). Phytopath. 14: 122-123. Feb. 1924.

Severin, Henry H. P. Curly leaf transmission experiments. Phytopath. 14: 80-93. Feb. 1923.

__________________ Same title (Abstract). Phytopath. 14: 123. Feb. 1924.

Leafspot and rot caused by Phoma betae Oud.

This disease was reported from Minnesota, Idaho, and Utah. It was usually below the average in prevalence and destructiveness. Richards of Utah says: "This disease is accurately related in its epidemic from to the amount of rainfall during June, July and August. It occurred only in fields of poor tilth and culture, and under conditions of inadequate irrigation." The seedling rot or damping-off was reported associated with this organism in Michigan and Utah. Dr. Dean A. Pack, Salt Lake City, writes as follows:

> "In the western part of Weber and Davis Counties, Utah, Phoma appeared in very small isolated patches over an area of about 3100 acres of sugar beets. While the attack was general, appearing in nearly every field, there was probably less than one per cent injury done. This is very unusual, since ordinarily we could have looked for a loss of 20 to 30 percent of the crop in this district.
>
> "I visited the fields early in June and several times during the summer and each time noted that the disease did not spread, as it usually does."

Campanile, Giulia. Sulla Phoma betae Frank come agente della moria delle bietole nei semenzai in Italia. Boll. Mens. Inform. e Not. R. Staz. Patol. Veg. Roma. 4: 39-48. Apr.-June 1923.

Nematodes (Heterodera spp.)

Sugar beet nematode, H. schachtii Schmidt

Mr. Gerald Thorne of the Office of Sugar Plant Investigations reports as follows regarding the sugar beet nematode situation:

"New infestations found by Mr. L. A. Giddings of the Sugar Plant Office: Colorado - Sterling, Sedgwick, Julesburg, Fort Morgan, Brush, and Snyder; Nebraska - Gering; Montanta - Billings. At each of these points from one to five infested fields were found.

"Utah: From field records and other reports it is estimated that 85% to 90% of the infested areas were under crop rotation and the loss for the state probably did not amount to over 1,000 tons.

"Idaho: Only a few fields in the Preston-Whitney section suffered any loss, practically all of the severely infested fields being under rotation.

"Colorado: About 85% of the infested fields under crop rotation. Three hundred tons would probably cover the losses.

"California: Very little data available but the loss was much lower than usual due to the elimination of many of the severly infested areas.

The figures given are only estimates based on information furnished by sugar company men."

Mr. Rittue, also of the Sugar Plant Office, reported the sugar beet nematode as causing 7.8% loss in California. According to Eubanks Carsner of the same office, the nematode was especially destructive in the region around Chino, California. Brown stated that in Arizona demonstration fields for beet seed production were infested with this nematode.

Recent literature

Müller, H. C. & Molz, E. Versuche über den Einfluss der verfrucht auf den Nematodenbefall und den Ertrag der Zuckerrüben. Blätt. Zuckerrubenb. 30: 89-94. July 31, 1923.

Thorne, Gerald. Suggestions for control of nematode. Through the Leaves 1923: (March); 97-99. The Great Western Sugar Co. Longmont, Colorado, 1923. This popular article gives a brief description of the sugar beet nematode (Heterodera schachtii) with its habits and methods of control, the latter based entirely on crop rotation and prevention of infestation. (Cf. also Facts About Sugar 16: 192-193. 1923). Frederick V. Rand. (Bot. Absts.)

_______________ Length of the dormancy period of the sugar-beet nematode in Utah. U. S. Dept. Agr. Dept. Circ. 262: 1-5. Feb. 1923.

Root-knot nematode, H. radicicola (Greef) Müll.

Crawford reports the occurrence of the root-knot nematode on 50% of the sugar beet acreage in New Mexico, which is limited, however, with a reduction in yield of about 5%. Rittue of the Sugar Plant Office reports this nematode as causing 3% loss in California.

Other diseases

Root rot caused by Rhizoctonia sp. was reported as less than usual in Ohio, Michigan, Wisconsin, more in Iowa and about the same in Colorado and Utah. Coons, of Michigan, says: "About 10% of early plantings plowed up on account of 'Black Root' chiefly Rhizoctonia. Late plantings though badly hit by disease with favorable weather conditions following gave good stand." In one case in Colorado the disease was severe in a field that had been flooded earlier in the season. Richards, of Utah, says: "The possible damage that might result from this disease is shown by the fact that this year two fields were found in which apparently 60% of the crop was destroyed." Rhizoctonia sp. causing root rot of sugar beet was reported from California for the first time. (Smith, E. H. Some diseases new to California. (Abstract). Phytopath. 14: 125. Feb. 1924).

Crown gall caused by Bacterium tumefaciens EFS. & Towns., Ohio, Michigan; rot caused by Fusarium sp., Washington; rust caused by Uromyces betae (Pers.) Tul., California (reported by Harter and Weimer as common); mosaic, cause undetermined, Indiana (3% loss), Kansas.

DISEASES OF TOBACCO

Wildfire caused by Bacterium tabacum Wolf & Foster

The wildfire disease which reached such alarming proportions in 1922 was much less serious in 1923. Heavy seed bed infection was noted in May in Massachusetts, Connecticut, New York and Pennsylvania, but the dry weather which followed successfully held the disease in check. Reports of the disease were also received from Maryland, Kentucky, North Carolina, South Carolina, Georgia, Florida, Southern Illinois, and Wisconsin. This is apparently the first report from Illinois. States which reported wildfire in 1922 but not in 1923 are New Hampshire and Virginia. Thomas, of New York, examined 48 seed beds in Chemung County on June 12, 1923 and found 24 healthy; of the balance 9 showed slight, 6 moderate, and 9 severe infection. The outbreak of wildfire in Georgia was traced to the use of unsterilized cloth which had been previously used in Connecticut. Johnson, of Wisconsin, reports wildfire only where the beds were near the tobacco sheds. Valleau reports that it occurred in Kentucky where the men in handling the seed beds had chewed leaves of last year's infected crop and spit the juice onto the young plants.

Recent literature

Conant, G. H. The "wildfire" disease of tobacco in Wisconsin. Wis Dept. Agr. Bul. 52: 58-66. Dec. 1922.

Anderson, P. J. and G. H. Chapman. Tobacco wildfire in 1922. Mass Sta. Bul. 213: 27. 1923.

Chapman, G. H. and P. J. Anderson. Wildfire of tobacco, 1922. Conn. State Sta. Tobacco Substa. Bul. 2: 7-38. 1922.

Johnson, James. Experiments with dusting and spraying for the control of tobacco wildfire in seed beds. (Abstract) Phytopath. 14: 50. Jan. 1924.

Johnson, James and H. F. Murwin. Disinfection of tobacco seed against wildfire. (Abstract) Phytopath. 14: 50. Jan. 1924.

Tisdale, W. B. Control of tobacco wildfire. Florida Agr. Exp. Sta. Press Bul. 349. 2 p. Nov. 1923.

Anon. To control wildfire in tobacco. Jour. Dept. Agr. South Africa 6: 480-481. June 1923. See reference under angular leafspot for further information.

Angular spot or blackfire caused by Bacterium angulatum Fromme and Murray

Angular spot or blackfire was reported from Virginia (2%), South Carolina (t), Kentucky (12%), Florida (t), Louisiana (5-7%), Indiana (t). The only states where blackfire has assumed serious proportions are Kentucky and Louisiana. Valleau, of Kentucky, says the principal means of spread is the chewing of leaves of last year's diseased crop and spitting the juice onto the plants in the seed bed. Control of the disease was secured by seed treatment and sanitation. Dark tobacco is resistant, according to Valleau, until just before it matures, but from that time on it is very susceptible. Infected leaves are ruined for wrappers but may be used for cigarettes, according to Gardner, of Indiana.

Recent literature

Ludwig, C. A. Tobacco wildfire and blackfire. Clemson Agr. Col., South Carolina. Ext. Circ. 53: 7-12. 1923.

Valleau, W. D. An important period in the life history of two bacterial organisms causing leafspots on tobacco. Phytopath. 13: 140-144. Mar. 1923.

Valleau, W. D. and Charles Hubbard. Angular leafspot and wildfire infection of plant beds by spitting. (Abstract) Phytopath. 14: 51. Jan. 1924.

Black root rot caused by Thielavia basicola (B. & Br.) Zopf.

Black root rot was reported about as usual in Massachusetts, Connecticut, Pennsylvania, Kentucky, and Florida and less than usual in Virginia, Ohio, Indiana, and Wisconsin. Mention is made of the following resistant varieties or strains: Kentucky Experiment Station resistant strain of White Burley in Kentucky; Connecticut Round Tip in Florida; Kentucky resistant Judy's Pride in Indiana; Wisconsin Resistant Havana; Hibshman and Olson largely grown in Pennsylvania are replacing the less resistant types of Leaman and Espenshade. Turkish tobacco proved almost immune in Kentucky (1), and in Georgia (2) some highly resistant strains of Sumatra have been developed. Owing to prejudice of buyers against Wisconsin Resistant Havana a new strain having superior quality is being developed. The high temperatures during early summer were largely responsible for the decrease in the amount of black root rot.

Recent literature

1. Anon. Tobacco disease investigations in Kentucky. Ky. Exp. Sta. Rpt. 1922. pt. 1. pp. 22-24. Turkish tobacco almost immune.

2. _____ Plant Diseases. Georgia Sta. Rpt. 1922. 14-16. Some highly resistant strains of Sumatra have been obtained.

3. Orton, C. R. and Otto Olson. Progress report upon the resistance of commercial strains of tobacco to root rot. (Abstract) Phytopath. 14: 51. Jan. 1924.

Mosaic, cause undetermined

Mosaic on tobacco was unusually prevalent in Wisconsin (10%) and Virginia (2%) in 1923. In the other tobacco areas it was about as usual. Reports were received from Connecticut, New York, Pennsylvania, Virginia, Florida, Ohio, Indiana, Kentucky, and Wisconsin. The disease appeared coextensive with the crop but as the symptoms appeared late in the season little damage was estimated. W. B. Tisdale, of Florida, reported that mosaic was more prevalent under shade and was evidently spread by laborers from infected to adjacent plants. Thomas says that mosaic was the most conspicuous disease of tobacco present in Ohio.

The control of tobacco mosaic by eradicating solanaceous weed carriers was given further demonstration in Kentucky. Valleau reports as follows:

> "Eradication of bull nettle and ground cherries. We have attempted to free a large tobacco bed of these weeds and have thereby obtained some interesting facts in regard to the weeds. Usually the root system consists of a straight tap root extending down 20 to 30 inches. Occasionally laterals run under the surface and parallel to it at a depth of about 6 or 8 inches. Bull nettles dug out to a depth of 16 inches and dirt filled over the remaining root are capable of sending up new shoots to the surface. The only practical means of eradication of the weeds we have found is to dig them out with an ordinary 2-jawed post hole digger. An entire root may be left intact and the dirt completely removed from about it, if care is used. If the root branches off the broken end can readily be seen in the middle of the hole. Only a few minutes is required to remove an entire root with this tool."

Recent literature

Elmer, O. H. Mosaic cross-inoculation studies. (Abstract) Phytopath. 14: 55. Jan. 1924

Walker, M. N. The mosaic disease of Nicotiana glutinosum not distinct from tobacco mosaic (Abstract) Phytopath. 14: 57. Jan. 1924.

Rawlins, T. E. and James Johnson. Cytological studies on tobacco mosaic. (Abstract) Phytopath. 14: 55. Jan. 1924.

Other diseases

Frog-eye caused by Cercospora nicotianae Ell. & Ev. was particularly severe in Kentucky where the loss was estimated at 5%. It occurred mostly on Burley tobacco. Dark tobacco was practically free from infection. The wet season is held largely responsible for the increased severity. It was reported as a minor trouble in South Carolina, Florida, Indiana and Porto Rico.

"Wisconsin bacterial leafspot" ("rust") has been described by James Johnson (2) as due to Bacterium melleum n. sp. The organism was first isolated in 1917, but is believed to have been present prior to that time. It has been observed several times since 1917 in the vicinity of Madison, and was found in one field in 1923. In other states than Wisconsin only one specimen has been collected which is certainly of the same disease. This was from Kentucky in 1919.

Black shank caused by Phytophthora nicotiana de Haan was reported by Tisdale from Florida as follows:

> "This disease appeared in many new fields and caused heavy loss. Connecticut Round Tip appears 100 per cent susceptible, while the Big Cuba shows some resistance. Encouraging results have been obtained in isolating resistant strains of Big Cuba."

Phytophthora sp. causing blight in seed beds was reported from Porto Rico. According to Cook and Toro it has not been reported previously, but the natives say that it is of periodic occurrence.

Root knot caused by Heterodera radicicola (Greef) Müll. was reported from Pennsylvania, South Carolina, and Florida. Tisdale, of Florida, states: "Practically all sandy land is more or less affected. The continued rains seemed to enable affected plants to obtain sufficient moisture to prevent much stunting."

Leafspot of unknown cause supposed to be associated with drought conditions was unusually prevalent in Virginia causing an estimated loss of 1.5%. Growers often confused it with black-fire and wildfire. Spots of this type were also reported from Connecticut, South Carolina, and Wisconsin, although in the latter state they were very rare.

Frenching was reported as of minor importance in Kentucky, South Carolina, and Florida. Tisdale, of Florida, says: "This disease occurred on one acre of a 4-acre shade. The acre affected was old land which had been cropped to corn and sweet potatoes for years, while the acreage unaffected was new land. This was the first crop of tobacco."

A new root rot due to unknown conditions is reported from Kentucky by Valleau. This rot differs from black root rot in that the roots which rot remain white or slightly pink. No causal organism determinations were made. The disease was seen both on new and old tobacco soil. Some strains resistant to black rot were not resistant to this new trouble.

Olpidium brassicae (Wor.) Dangeard was observed on the roots in a greenhouse at the University of Wisconsin. It has not previously been reported in this country (1).

Granville wilt caused by Bacterium solanacearum EFS., Virginia (locally severe in Greenville and Mecklenburg Counties); white speck caused by Macrosporium tabacinum Ell. & Ev., Ohio; brown spot caused by Alternaria sp., Ohio; wilt probably caused by Fusarium sp., Pennsylvania; stalk cankers caused by Pythium debaryanum Hesse, Connecticut; damping-off and sore shin caused by Pythium sp., and Rhizoctonia sp., Wisconsin; damping-off caused by Rhizoctonia solani Kuhn, Connecticut; sore shank due to the same organism, Virginia; drowning caused considerable loss to tobacco in Christain County in western Kentucky.

Recent literature

1. Bensaude, Mathilde. A species of Olpidium parasitic in the roots of tomato, tobacco, and cabbage. Phytopath. 13: 451-454. Oct. 1923.

2. Johnson, James. A bacterial leafspot of tobacco. Jour. Agr. Res. 23: 481-493. Feb. 10, 1923.

3. Tisdale, W. B. Progress report on Phytophthora resistant tobacco. (Abstract) Phytopath. 14: 51. Jan. 1924.

DISEASES OF MISCELLANEOUS VEGETABLE CROPS

ARTICHOKE, JERUSALEM

Wilt caused by Sclerotium rolfsii Sacc. of slight importance in Louisiana.

Powdery mildew caused by Erysiphe cichoracearum DC. was reported by Clinton as abundant October 5 at Mt. Carmel, Connecticut. Both conidial and ascospore stages were present.

ASPARAGUS

Rust caused by Puccinia asparagi DC.

This disease is not considered by collaborators to be a serious menace to asparagus culture except in limited sections in New Jersey, (Gloucester County), South Carolina and in Oklahoma and California in which latter states its occurrence is considerably localized. It was reported as present but of no commercial importance in Connecticut, New York, Pennsylvania, Delaware, Texas, Ohio, Illinois, Wisconsin, Minnesota, Iowa, North Dakota, Colorado and

Washington. The amount of rust in Ohio in previous years has resulted in the extensive use of resistant varieties. It is assumed that a similar statement could be made in regard to the rust situation in other states, if information was available.

Other diseases

Rot caused by Fusarium sp. was reported by Chupp, of New York, as causing much comment among growers. The loss was estimated at a trace to 2%.

Leaf and stem spot caused by Cercospora sp. was reported as new to California. (2).

Frost in May caused several complaints in June, according to Clinton of Connecticut. Later cuttings were not injured. The frost supplemented by hot weather in early June caused the growth to branch prematurely and remain stunted

References

1. Cook, Mel. T. Dwarf asparagus. Phytopath. 13: 284. 1923.

2. Smith, E. H. Some diseases new to California. (Abstract). Phytopath. 14: 125. Feb. 1924.

BEET (Garden)

Leafspot caused by Cercospora beticola Sacc. was reported to have caused 5-10% loss in Florida, Texas 2%, Indiana 2%, Illinois 1% and to be important in some sections of Colorado. It was noted as present but unimportant in Connecticut, New York, New Jersey, Delaware, North Carolina, South Carolina, Mississippi, Louisiana, Oklahoma, Wisconsin, Minnesota, and North Dakota. In limited sections of Delaware and South Carolina some damage was recorded.

Scab caused by Actinomyces scabies (Thax.) Güssow was reported from Ohio, North Dakota, and Idaho. In no case was it of economic importance.

Crown gall caused by Bacterium tumefaciens EFS. was found on 8 specimens in a 4 acre field at M. A. C. by Coons, Michigan.

Damping-off caused by Pythium debaryanum Hesse was reported in isolated fields in New York on muck soil.

Root rot caused by Rhizoctonia sp., New Jersey.

Root knot caused by Heterodera radicicola (Greef) Müll., South Carolina, Texas (loss 3%).

Dodder, Cuscuta sp., Washington.

CARROT

Leaf blight caused by Macrosporium sp., probably carotae E. & L. was common in most sections of New York and New Jersey, but caused minor damage. In Mississippi it was very serious around the Crystal Springs trucking section in late January, in one case causing a loss of 75%, several fields were plowed up because the market would not take diseased tops. Weber, of Florida, reports the yield reduction in one field 50%. The disease was first noticed when the plants were six inches high. The disease progressed rapidly and in three weeks the entire plants were dead.

Soft rot caused by B. carotovorus Jones was reported as present in New York and Colorado. The loss was usually slight but amounted to 1% in some New York storehouses. In some houses the bacterial rot was accompanied by a Sclerotinia rot causing damage up to 2%.

Black rot caused by Alternaria radicina Meier, Drechsler and Eddy was reported only from New York where it caused a loss of 1 to 3% in many storage houses. Harter and Weimer found a rot at Compton, California, which they considered might be caused by Alternaria.

Root knot caused by Heterodera radicicola (Greef.) Müll. was reported in two gardens in LaFayette, Indiana.

Rhizoctonia disease caused by Corticium vagum Burt, New York, unimportant.

Southern blight caused by Sclerotium rolfsii Sacc., Mississippi.

CASTOR BEAN

Leafspot caused by Cercospora ricinelli Sacc. & Berl. was reported by Weber, of Florida, as general over the state and the cause of partial defoliation.

Texas root rot caused by Ozonium omnivorum Shear, reduced the yield 8% in Texas.

Recent literature

Godfrey, G. H. Grey mold of the castor bean. Jour. Agr. Res. 23: 679-716. 1923.
Sclerotinia ricini Godf.

Dasheen (Colocasia sp.)

Rhizoctonia solani Kuhn was observed at Los Angeles on August 20, by Harter and Weimer. It was not causing serious damage.

EGGPLANT

Fruit rot caused by Phomopsis vexans (Sacc. & Syd.) Harter

The fruit rot and a leaf spot caused by the same fungus caused losses in Florida, averaging 10%, in Alabama 30%, and Louisiana 37%. The crop in some fields in these states was almost a complete failure. Weber, of Florida, says no fields were found that were entirely free from the disease. This disease is also said to have caused a loss of 5% in Maryland and a trace in Iowa, and was present in New Jersey, Indiana, Missouri, and Porto Rico.

Spraying with Bordeaux for the control of leafspot is not successful, according to Miles, of Alabama. Experiments in the production of a resistant strain by crossing the commercial variety with the wild eggplant are being conducted in Florida by A. C. Foster of the U. S. Department of Agriculture.

The fungus is said by Haenseler, of New Jersey, to overwinter in seed from rotten fruits. Compost in which are found rotten fruits will also carry over the fungus under New Jersey conditions.

Other diseases

Wilt caused by Verticillium albo-atrum Reinke. & Berth. was reported only from New York and New Jersey, where it was about the same as last year. Haenseler, of New Jersey, says: "Extensive drought in some local sections caused increase in losses from wilt. The disease seems to be least destructive in quite acid soils."

A wilt not designated as to cause was also reported from Illinois, Kentucky and California.

Bacterial wilt caused by Bacterium solanacearum EFS. was reported as common in Florida causing a loss of 2 to 4%. It attacked the plants most severely just before blossoming time. It was also noted in one field at Baton Rouge, Louisiana.

Southern blight caused by Sclerotium rolfsii Sacc. was very serious in the vicinity of Gainesville, Florida, one 20 acre field lost 60% of its plants. It was especially noticeable May and June. Other diseases reported from Florida only were damping-off caused by Rhizoctonia sp., (considerable damage in seed beds); and stem rot caused by Nectria ipomoeae Hals. (Fusarium stage causing wilt at Bradentown).

Mosaic, cause unknown, and rot caused by Phytophthora terrestris Sherb. were reported only from Indiana. The mosaic occurred in a field adjacent to mosaic peppers.

Anthracnose caused by Colletotrichum sp., New Jersey, Missouri (considerable loss); leafspot caused by Macrosporium solani E. & M., New York, Alabama; stem blight or watery soft rot caused by Sclerotinia libertiana Fckl., Florida (Sanford section), Louisiana (consideragle damage in lower section from December to March);

ENDIVE

Crown rot caused by Botrytis sp. was reported from Canastota, New York. One man grew 3000 bushels of the roots, and during the warm autumn many began to rot and were covered with the Botrytis.

GANDULES PIGEON PEA (Cajanus indicus)

Rust caused by Uromyces dolicholi Arth. was reported from Porto Rico by Cook and Toro as mild and common in all plantations.

Collar rot, cause not determined, destructive in the west end of Porto Rico Island.

GINSENG

Damping-off, cause undetermined, was reported June 4 from Tuscarawas County, Ohio. It was causing considerable injury to affected seed beds.

GROUND CHERRY

Leafspot caused by *Cercospora physalidis* Ell. was reported once in Ohio.

Mosaic, cause unknown, was reported in central and southern New Jersey. Crawford, of New Mexico, says that mosaic is common on species of wild perennial ground cherry such as *P. longifolia*, *P. lanceolata*, *P. cinerascens*, and *P. comata*.

White smut caused by *Entyloma australe* Speg. was reported from New York by Whetzel on July 19 on *Physalis pruinosa*. (Pl. Dis. Reporter 7: 58. Aug. 15, 1923). On August 10 it was collected in Nassau County on *Physalis francheti* by Mills.

HEMP (Cannabis sativa L.)

Stem blight caused by *Fusarium* sp. was reported by L. H. Dewey, of the Office of Fiber Plant Investigations, from the farm of Major W. S. Dunham, Wayne, Illinois.

> "Attacked by disease apparently caused by fungus beginning near the surface of the ground, causing leaves to wilt and turn brown without falling. The main stalk is discolored from the ground upward. Scattered small plants in commercial fields."

HEMP, MANILA (ABACA) (Musa textilis)

Banana wilt caused by *Fusarium cubense* EFS. was reported from the Philippine Islands. On this host the organism causes a heart rot.

Reference

Lee, H. A. and F. B. Serrano. Banana wilt of the Manila hemp plant. Phytopath. 13: 253-256. 1923.

____________________ Banana wilt and the Manila hemp plant. Philippine Agr. Rev. 16: 104-107. 1923.

LEEK

Wilt caused by *Fusarium* sp, was reported from New Jersey, August 6. The crop was completely wilted in a soft mass.

OKRA

Verticillium wilt caused by Verticillium albo atrum Reinke & Berth. caused a 30 to 40% loss on a small planting at the Illinois University Farm at Urbana. H. W. Anderson writes as follows:

> "It was certainly a disastrous disease where it occurred. This was due in part probably to the unfavorable soil situation where the okra was growing. We had an unusually wet season and water stood, at different times, for a period of several days on a portion of these plants."

Root knot caused by Heterodera radicicola (Greef) Müll. was serious locally in Alabama and Texas causing 1% loss in each state. The Italian truck gardens about Birmingham, Alabama were badly affected.

Wilt caused by Fusarium vasinfectum Atk., Florida, Alabama, Texas (loss 2%); root rot caused by Ozonium omnivorum Shear, Texas (loss 5%); leafspot caused by Phyllosticta sp., New Jersey; by Colletotrichum sp., Florida; damping-off caused by a number of different fungi, Florida (prevalent following unusual rains).

PARSLEY

Rot caused by Bacillus carotovorus Jones was reported from Florida where 90% of the plants in one garden were affected. It was not common.

Watery soft rot caused by Sclerotinia libertiana Fckl. was reported as usual from Louisiana.

Late blight or leafspot caused by Septoria petroselini apii Br. & Cav. caused slight damage in Burlington County, New Jersey.

PARSNIP

Leafspot caused by Ramularia pastinacae (Karst.) Lindr. & Vesterg. was noted in Nassau County, New York.

Leaf blight caused by Cercospora apii Fr. was noted at Wethersfield, Connecticut, no damage.

Root knot caused by Heterodera radicicola (Greef.) Müll. was noted at Wellington, Sumner County, Kansas.

PEANUT

Leafspot caused by Cercospora personata (B. & C.) E. was reported from South Carolina, Florida, Alabama, Mississippi, and Louisiana. In Florida Weber states:

> "Leafspot was the most important disease of peanuts during the

past season. The infection was found when the plants were a few inches high and continued in severity until the plants were mature when they were three-fourths defoliated."

Southern blight caused by Sclerotium rolfsii Sacc. caused losses of 1% in Florida and Texas, and was noted in Mississippi. It was said to be especially serious in Florida following the rains, and in Texas on light soils.

Root or foot rot, associated with species of Chaetodiplodia, Fusarium, and Botrytis was reported by Ludwig of South Carolina as severe at McColl, July 12, loss 10%.

Wilt caused by Fusarium sp. was reported by Weber to be causing some loss in fields near Gainesville, Florida.

Texas root rot caused by Ozonium omnivorum Shear caused 6% loss in Texas. It was present on the black lands.

Chlorosis caused by too heavy applications of lime was reported from Texas, loss - trace.

Recent literature

Anon. A new disease in peanuts. Jour. Dept. Agr. South Africa 6: 480. June 1923.

_____ New peanut disease. Jour. Dept. Agr. South Africa 7: 191. Sept. 1923. Called by some growers rosette, thought to be due to nematodes.

PEPPER

Anthracnose caused by Colletotrichum nigrum Ell. & Hals. was very important in Kentucky, found in 50% of the commercial plantings, reducing the total yield 20%. It was also serious about the Sanford district of Florida. The loss in Florida was estimated at 2%. An anthracnose attributed to Gloeosporium piperatum Ell. & Ev. was also reported from Florida at Gainesville said to be causing a 4% loss. The same fungus reported under the name Glomerella piperata (Ell. & Ev.) S. & S. was noted once in Mississippi.

Mosaic, cause not determined, was noted in New Jersey, Louisiana, Indiana, Wisconsin, New Mexico and California. Gardner, of Indiana, and Crawford, of New Mexico, both mention that it is worse on Chile pepper than on other varieties tested. The loss in Louisiana was estimated at 5-10%. In Santa Ana County, California, Harter and Weimer found the mosaic very serious and fairly common at Stanton.

Wilt caused by Fusarium sp. was reported as serious near Wauchula, Florida but not common in other trucking sections of the state. It was reported by Brown, of Arizona, as causing a 35-50% loss on 300 acres north of Tucson. Crawford reported the wilt as more prevalent than usual in New Mexico, reducing the yield 25%. He states that the wilt was most severe on Chile and that their selection No. 9 was somewhat resistant. There was no evident relation between soil moisture and the amount of wilt.

Fruit spot caused by Macrosporium sp. was reported from New Jersey, Florida, Wisconsin, Missouri, and California. Weber, of Florida, says:

> "Proved to be the worst disease of pepper during the past season. The fungus attacks all injured fruits, caused by mechanical injury, insects or sunburn. In many fields 60% of the fruits were unmarketable. Estimated loss of 10% attributed to this disease."

In Wisconsin it was abundant and destructive on sweet pepper and only slightly troublesome on hot peppers.

Bacterial leafspot caused by Bacterium vesicatorium Doidge was reported by Weber as very destructive near Gainesville, Florida where a field of 800 plants were almost all killed. It was not reported elsewhere in Florida, and only a trace in Indiana.

Leafspot caused by Cercospora capsici Heald and Wolf was very common in Florida, according to both Weber and Foster. Three per cent loss from this cause is Weber's estimate. It was also reported as minor in Texas and severe in Porto Rico.

Bacterial wilt caused by Bacterium solanacearum EFS., locally important in Alabama and Texas; root rot caused by Rhizoctonia sp., Florida (5% damage in seed beds), California; southern blight caused by Sclerotium rolfsii Sacc., present but not of great importance in Alabama, Mississippi, Louisiana; root knot caused by Heterodera radicicola (Greef) Müll., California (common near Stanton), New Mexico (considerable, loss 10%), Florida; grey mold caused by Botrytis cinerea Pers., Connecticut; leafspot caused by Phyllosticta sp., New Jersey; rot caused by Phytophthora terrestris Sherb., Indiana; sunburn, South Carolina, Florida, Mississippi, California; bud rot, cause unknown, Florida (important).

Recent literature

Higgins, B. B. The diseases of pepper. Georgia Agr. Exp. Sta. Bul. 141: 47-75. 1923.

RHUBARB

Leafspot caused by Ascochyta rhei Ell. & Ev. was reported on mature leaves in New Jersey, Delaware, and Indiana. No loss estimated.

Leafspot caused by Phyllosticta straminella Bres. was widespread in New York and Illinois causing an estimated loss of .5%. A first report on the leafspot was received from White of Kansas, where it was noted at Leavenworth after harvest as a severe leaf spotting. Blade rotting was reported on 5% of the plants in Nassau County, New York.

Crown rot caused by a species of Phytophthora, probably P. cactorum (Leb. & Cohn) Schr., was reported from Pennsylvania and New Jersey, and from Michigan for the first time. Godfrey reports a foot rot caused by P. parasitica rhei Godf. present in Maryland, Virginia, the District of Columbia, and Illinois, and observed for the first time in Delaware; and an unidentified species of Phytophthora from Missouri.

Literature

Godfrey, G. H. A Phytophthora foot rot of Rhubarb. Jour. Agr. Res. 23: 1-26. 1923.

SALSIFY

White rust caused by Albugo tragopogonis (DC.) Gray was reported present in New York, Pennsylvania, and Wisconsin.

Powdery mildew caused by Erysiphe cichoracearum DC. was reported as present in Connecticut and Missouri.

SPINACH

Downy mildew caused by Peronospora effusa (Grev.) Rab. was reported as the most ever seen in Connecticut and on Long Island, New York. Newhall says this unusual prevalence was due to the wet week the first part of June. The loss was 8 to 15%. Many fields were plowed under. It was reported as present in Pennsylvania and Colorado and causing 8% loss in Texas. One carload shipped to Connecticut from Texas arrived in bad shape because of wet rot following downy mildew.

Wilt caused by Fusarium spinaciae Sherb. was described as new from Idaho (1). A Fusarium wilt was reported from Texas which may be a different species according to Taubenhaus (2); and from California.

Mosaic, cause unknown, was reported from New Jersey, the District of Columbia, Virginia, and Indiana. The resistant strain of Savoy is giving good satisfaction in Indiana and New Jersey as well as in Virginia. The Victoria variety commonly grown is quite susceptible.

Damping-off of mature plants caused by Pythium sp. was severe in the fields in various parts of New Jersey, appearing about September 20. (Pl. Dis. Reporter 7: 106-107. Nov. 1, 1923).
F. C. Meier of the Office of Cooperative Extension Work of the Department of Agriculture observed a similar trouble in a field in the vicinity of St. Paul, Minnesota.

Damping-off caused by Pythium sp. and Rhizoctonia sp. was reported by Beach as causing heavy loss in late sowings in Pennsylvania.

Root rot caused apparently by Rhizoctonia sp., the only pathogene associated with the disease, was severe locally in Delaware, according to Adams.

Anthracnose caused by Colletotrichum spinaciae E. & H., Texas; leafspot caused by Cercospora flagelliformis E. & H., Delaware; prematuring caused by hot weather, Connecticut; frost injury, Florida, Texas.

Recent literature

1. Hungerford, C. H. A Fusarium wilt of spinach. Phytopath. 13: 205-209. May 1923.

2. Taubenhaus, J. J. Studies on Fusarium wilt of spinach in Texas. (Abstract). Phytopath. 14: 29. Jan. 1924.

SPINACH, NEW ZEALAND

Leafspot caused by Cercospora sp. was reported by Gardner from LaFayette, Indiana. This spinach is Tetragonia expansa and is unrelated to the common spinach, Spinacia oleracea.

SWISS CHARD

Leafspot caused by Cercospora beticola Sacc. seemed to be coextensive with the crop being reported from Connecticut, New York, South Carolina, Texas, Illinois, and Colorado. The losses were usually minor although Tehon of Illinois notes one instance with beets next to chard where there was severe infection and 50% loss.

TANGO (Chrysanthemum coronarium)

This plant, used as a vegetable, has been found affected by Bacterium solanacearum EFS. in the Philippine Islands, according to Welles and Roldan. (Phytopath. 13: 488-491. Nov. 1923).

UDO (Aralia cordata)

J. L. Weimer (1), reports two diseases of udo, a root rot caused by Sclerotinia libertiana Fckl. and a wilt caused by Verticillium albo-atrum Reinke & Berth.

Literature Cited

Weimer, J. L. A root rot and wilt of udo. (Abstract). Phytopath. 14: 124. Feb. 1924.

WONDERBERRY (Solanum nigrum guineense)

Wilt caused by Fusarium sp. was found causing the death of plants at Kinkel, Florida by Weber.

YAUTIA (Xanthosoma sp.)

This crop which is extensively grown in Porto Rico is said by Cook and Toro to be affected by two root rots of unknown cause which they are investigating by root rot caused by Sclerotium rolfsii Sacc., and by two leaf spots caused by Macrosporium sp. and Phyllosticta colocasia.

Reference

Cook, M. T. and R. A. Toro. A Sclerotium disease of Yautia. Phytopath. 14: Abs. Cincinnati Meeting 1923. 1924.

DISEASES OF CEREAL AND FORAGE CROPS

IN THE UNITED STATES IN 1923

Prepared by R. J. Haskell, Plant Pathologist,
Plant Disease Survey.

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INTRODUCTION

The following summary of cereal and forage crop diseases in the United States is modeled after those that have preceded it in other years. The sources of information are the same, namely, (1) the collaborators of the Plant Disease Survey, (2) the Office of Cereal Investigations of the U. S. Department of Agriculture, (3) recent literature, and (4) the Plant Disease Survey of the Dominion of Canada (Survey of the prevalence of plant diseases in the Dominion of Canada 1923, fourth annual report). Only a small amount of information contained in this Canadian report has been used in the present summary and so readers are referred directly to it for detailed information regarding Canadian diseases.

An attempt has been made to condense the 1923 summary even more than those for other years by incorporating in it only the new facts that have been obtained during the year and by quoting fewer of thecooperators' reports than heretofore.

Nineteen hundred and twenty-three was not an unusual year for cereal diseases in general. Some diseases were more, and some were less prevalent than usual and naturally they varied greatly in severity in different parts of the country. Since stem rust is one of the most important cereal diseases and because of the recent efforts to control it through eradication of the barberry, the outbreak of this disease in parts of the spring wheat area was especially noteworthy. The disease was more serious than it has been for the past two years, but the epidemic was not nearly so severe as those of 1916 and other years prior to the barberry eradication efforts.

Another noticeable feature of the cereal disease situation was the comparatively light attack of the leaf rusts of wheat and rye. During 1921 and 1922 these diseases were quite destructive, but in 1923 they were noticeable for their absence in many cases.

Black chaff of wheat was particularly conspicuous in the states from Oklahoma northward, and somewhat more wheat scab than usual occurred in the upper Mississippi River Valley. Diplodia dry rot of corn was serious especially in the central and western sections of the corn belt.

Several diseases are worthy of special mention on account of their being comparatively new in this country, or because of their increasing severity.

Among these are flag smut of wheat, which now is known to occur in three States, take-all of wheat, the powdery mildew of red clover, that has been epiphytotic for the past three years, the "pasmo" disease of flax, an apparently recent introduction, corn mosaic in Louisiana, head smut of corn in Washington, and the bacterial diseases of soybeans and cowpeas.

New Diseases

(See following text for details)

The following organisms were found for the first time to be the cause of cereal and forage crop diseases in the United States during 1923.

Barley

Helminthosporium californicum described from California.

Corn

Cephalosporium acremonium Corda. Reported by Reddy and Holbert as widespread in the United States.

Sorghum and broomcorn

Bacterium andropogoni was described by Charlotte Elliott and E. F. Smith.

Clover

Sphaerulina trifolii, first time reported in this country; Missouri, New York, Illinois, on *T. repens*, *T. hybridum*, *T. pratense*.
Bacterium trifoliorum n. sp., Wisconsin, North Carolina, District of Columbia, Iowa, Indiana, Virginia, and Maryland on *Trifolium* spp.

Cowpea

Bacterium vignae n. sp. described from Indiana. Reported also from Florida and Kansas.

Soybean

Diaporthe sojae n. sp., described from North Carolina. Also reported from Indiana.
Peronospora sojae n. sp., described from North Carolina.

Grasses

Bacterium albopraecipitans on *Chaetochloa spp.*, Arkansas.
Bacterium coronafaciens atropupureum on *Agropyron repens*, *Bromus inermis*, and by inoculation on *Bromus spp.*, Wisconsin and North Dakota.
Bacterium panici on *Panicum miliaceum*, Wisconsin and South Dakota.
Helminthosporium spp. described by Drechsler (see text).
Mosaic on various grasses (see text).

Diseases found in new localities

(See text for details)

Wheat

Flag smut (*Urocystis tritici* Kcke.) Kansas-Wyandotte, Leavenworth, Atchison and Miami counties. Additional counties of St. Charles, Warren, Platte, and Buchanan in Missouri, and Macoupin, Greene, Scott, Logan, and Hancock in Illinois.

Take-all (*Ophiobolus cariceti* (Berk. and Br.) Sacc. North Carolina - Lincoln, Iredell, Cabarrus, and Alexander Counties. Tennessee - Knox County. California - Yolo County. New counties of Riley in Kansas and Clackamas in Oregon.

Foot rot (*Wojnowicia graminis* (McAlp.) Sacc. & D. Sacc. - New York.
Disease caused by *Sclerotium rhizodes* Auersw. - Washington.
Downy mildew (*Sclerospora macrospora* Sacc.) - Delaware.
Disease caused by *Bacterium atrofaciens* McCulloch. - Nebraska and Montana.

Rye

Loose smut (*Ustilago tritici*) Kentucky
Stem smut (*Urocystis occulta*) Ashland County, Wisconsin. The first report from this section of the state.

Barley

Take-all (*Ophiobolus cariceti* (Berk. & Br.) Sacc. California.

Buckwheat

Leafspot (*Ramularia rufo-maculans* Pk.) Indiana.
Leafspot (*Ascochyta fagopyri* Bres.) New York.

Flax

Pasmo (*Phlyctaena linicola* Speg.) Wisconsin, Minnesota and South Dakota.

Alfalfa

Root rot (*Sclerotinia trifoliorum* Eriks.) New York.
Violet root rot (*Rhizoctonia medicaginis* (DC.) Tul. Michigan.
White spot (Undet.) Michigan.
Nematode (*Tylenchus dipsaci*) Colorado.
Slime mold (*Physarum sp.*) Kansas.

Clover

Powdery mildew (*Erysiphe* sp.) Colorado.
Mosaic (Undet.) Louisiana - on red clover.
Root rot (*Sclerotinia trifoliorum* Eriks.) New York and Idaho.

Sweet clover

Ascochyta sp., Louisiana.

Cowpea

Nematospora phaseoli, - Illinois. (new host for this organism)

Mosaic

Mosaic, or mosaic-like diseases, were found on the following cereals, grass, and leguminous hosts during the year, - wheat, corn, alfalfa, clover (red, white, alsike and crimson), sweet clover, cowpea, and soybean.

SEED TREATMENT OF CEREALS

During the past two years much activity has been displayed by pathologists in the testing out of various chemical dusts, particularly copper carbonate, for control of cereal smuts, and in the comparison of these dusts with the standard formaldehyde and copper sulphate treatments. Many of these experiments have been conducted on a cooperative basis under the leadership of a committee representing the Crop Protection Institute and the American Phytopathological Society. The results of this cooperative work for 1923, participated in by ten states and four provinces in the Dominion of Canada, have been made available in mimeographed form (10). The following conclusions are given in the report (page 6).

> "Copper carbonate dust was the most satisfactory in controlling bunt of wheat and smut of hulless oats. This is true from the standpoint of seed germination, smut control, and yield. The copper carbonate dust reduced the amount of smut of hulled oats and covered smut of barley in all trials; but in about one-half of the tests the amount of reduction was slight. For these smuts it appears that copper carbonate dust is not as effective as formaldehyde, but in view of the lack of seed injury, the increased yield, and the many advantages of application, it is worthy of further trial.
>
> "Nickel carbonate did not effectively control any of the smuts, but in many cases it stimulated germination and gave increased yields over the check. None of the dust treatments gave consistently better results than copper carbonate."

Extensive trials by the Office of Cereal Investigations of the U. S. Department of Agriculture, (7, 11, 13, 15) and reports of collaborators from Virginia and Arizona, not included in the cooperation mentioned above, corroborate the above conclusion that copper carbonate is effective in the control of bunt of wheat.

Seed treatment with the new organic mercury compounds has also received much attention of late, especially from pathologists in the Office of Cereal Investigations. Tisdale, Taylor, and Leukel (14) have secured good control of the barley and oat smuts with several of the organic mercury compounds and have even increased the yield of barley in the absence of smut. Johnson, Leukel, and Dickson (6) have shown also that several of these compounds will control barley stripe (Helminthosporium gramineum) perfectly and at the same time not impair seed germination. Seed disinfectants having organic mercury as an active principle appear to have very promising possibilities in the control of diseases. They more nearly approach the ideal seed treatment compound, which not only controls disease but also stimulates the crop, than anything that has yet been tested.

The following are some of the reports regarding seed treatment that have been received directly by the Plant Disease Survey and are not included in the references given below.

Barley - Loose and covered smuts

Delaware: One grower disinfected his seed with "Semesan" and reduced covered smut from 22% to 0.5%. One field of spring barley where seed had been treated with Semesan showed only a trace of loose smut while untreated seed showed 1%. (Adams)

Seed treatment of cereals

Kentucky: Hot water treatment being used extensively in Fayette County with very satisfactory results with both loose and covered smuts. (Valleau)

Michigan: All seed stocks for increase in Michigan are given the hot water treatment. (Coons)

Barley - Helminthosporium diseases

Delaware: Spring barley treated with Semesan showed complete control of stripe while check contained 0.5%. In a field of winter barley treated with the same substance only 1% leaf blotch (H. sativum) was found on the lower leaves while 20% was found on the check. (Adams)

Wisconsin: Organic mercury compounds satisfactory in the control of both the spot blotch and net blotch. (Vaughan)

Recent literature:

1. Coons, G. H. Copper dust successful against stinking smut. Michigan Agr. Exp. Sta. Quar. Bul. 1: 3-8. Aug. 1923.
2. Dickson, B. T., R. Summerby and J. C. Coulson. Experiments in the control of oat smut. Ann. Rep. Quebec Soc. Prot. Plants. 15: 102-103. 1922-1923.
3. Fraser, W. P. and P. M. Simmonds. Cooperative experiments with copper carbonate dust and other substances for smut control. Scientific Agr. 3: 297-302. May 1923.
4. Fraser, W. P. and P. M. Simmonds. Dusting with copper carbonate and other substances for smut control. (Abstract). Phytopath. 13: 293-294. 1923.
5. Heald, F. C., G. L. Zundel and L. W. Boyle. The dusting of wheat and oats for smut. Phytopath. 13: 169-183. 1923.
6. Johnson, A. G., R. W. Leukel, and J. G. Dickson. New seed treatments for controlling stripe diseases of barley. (Abstract). Phytopath. 14: 42. Jan. 1924.
7. Mackie, W. W. and F. N. Briggs. Fungicidal dusts for the control of bunt. California Agr. Exp. Sta. Bul. 364: 533-572. May 1923.
8. Nelsall, A. Experiments on the dust method of smut control. Scientific Agr. 3: 303-307. May 1923.
9. Orton, C. R., E. C. Stakman, and E. B. Lambert. Results of cereal seed treatments, 1922. Crop Protection Institute. Unnumbered Mimeo. Cir. 1923.
10. Orton, C. R., E. C. Stakman and H. H. Flor. Results of cereal seed treatments 1923. Crop Protection Institute. Unnumbered Mimeo. Cir. 1924.
11. Stephens, D. E. Results of experiments on bunt prevention at Moro, Oregon, 1923. Cereal Courier. 15: 273-277. Sept. 1923.
12. Stakman, E. C. and E. B. Lambert. Dusting seed grain to prevent smut. Minnesota Agr. Ext. Spec. Bul. 70: 12. 1923.

13. Tisdale, W. H., J. W. Taylor and M. A. Griffiths. Experiments with hot water, formaldehyde, copper carbonate, and chlorophol for the control of barley smuts. Phytopath. 13: 153-160. April 1923.

14. Tisdale, W. H., J. W. Taylor and R. W. Leukel. Further studies on new seed disinfectants. (Abstract) Phytopath. 14: 43-44. Jan. 1924.

15. Tisdale, W. H., J. W. Taylor and R. W. Leukel. Report of seed treatment experiments for the control of smuts in wheat, barley, and oats in 1923. Cereal Courier 15: 221-225. Sept. 1923.

DISEASES OF CEREAL CROPS

WHEAT

Bunt caused by *Tilletia laevis* Kühn and *T. tritici* (Bjerk.) Wint.

Tilletia laevis occurred scatteringly over most of the wheat producing area of the United States with the possible exception of the Northwest, where *Tilletia tritici* is the predominating and important bunt. Except in the Northwest and locally in Delaware, Indiana, and Illinois the disease was reported of slight importance.

Idaho and Washington experienced more loss from bunt than usual, 8% infection being estimated in each state. Considerable infection also occurred in Montana, Oregon, and California. It is in this general section of the country that bunt is most severe.

In Delaware, J. F. Adams reported a decided increase in bunt, the millers in some sections docking farmers 15% on account of the disease. In Indiana statewide occurrence with a marked increase in prevalence was reported by C. T. Gregory. In Illinois, where the disease was unusually severe, a special survey to determine distribution and damage was conducted by the Illinois State Natural History Survey under the leadership of L. R. Tehon. Since this was the most careful survey for this disease that has been made in any state for some time, it seems advisable to give here a synopsis of the report on this work that has been filed with this office. (L. R. Tehon. A summary of the occurrence of and losses from bunt in Illinois. Manuscript.)

> Rumors of severe infection and large losses of wheat due to bunt during past years led to a special survey for this disease in 1922 and 1923. As a result it was ascertained that *Tilletia laevis* was the prevalent causal fungus, no specimens whatever of *Tilletia tritici* having been found; that as a wheat disease in Illinois bunt is second only to leaf rust in importance; that in 1923 4.08% bunt occurred in 1140 acres inspected in 22 wheat counties; that the reduction in value (dockage) of wheat presented for sale in 1923, due to the presence of bunt, amounted to approximately $100,000, which, added to the field loss of 2,275,000 bushels, makes a total money loss for the state of about $2,375,000.
>
> The distribution of bunt in Illinois is given in Figs. 8 and 9. It has been found in exactly one-half of the counties of the state, but these counties represent two-thirds of the total land area.

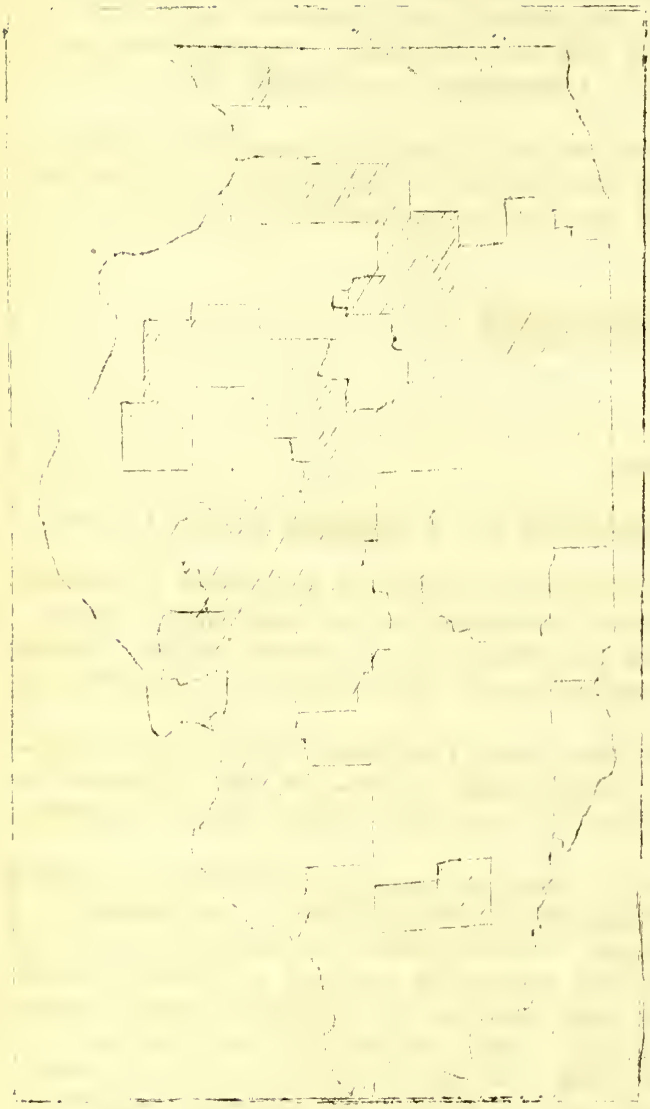

Fig. 8 Distribution of bunt in Illinois in 1923 as shown by inspections by Illinois State Natural History Survey.

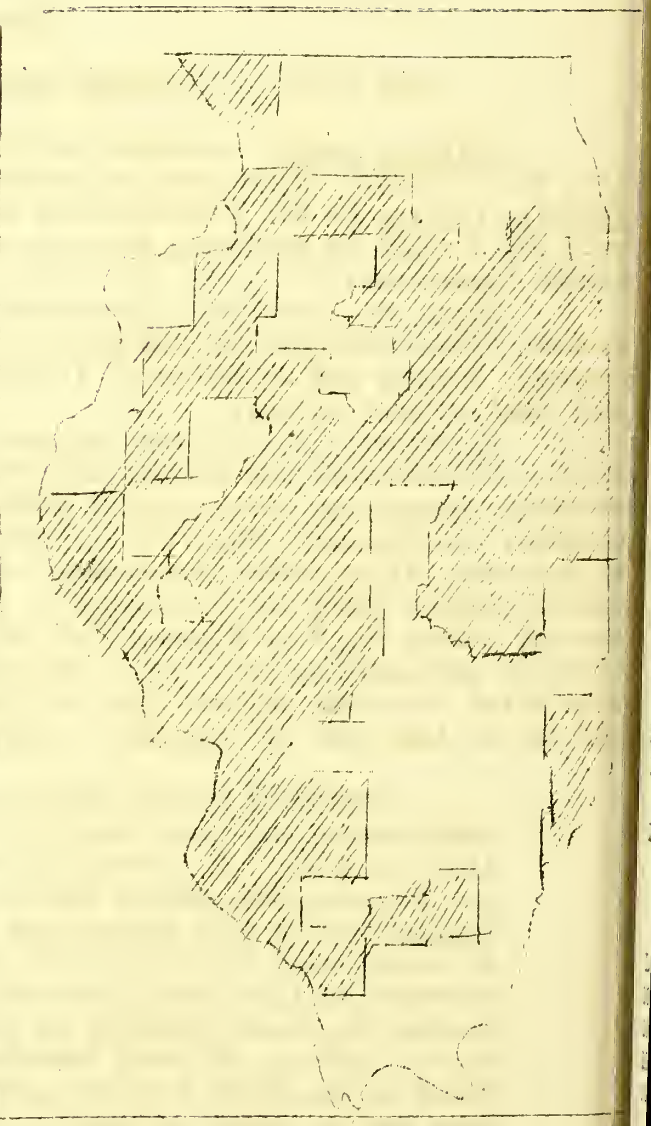

Fig. 9 Total known distribution of bun in Illinois according to records o Illinois State Natural History Sur

Bunt, however, has not taken its whole toll when it destroys the grain in the field. Excessive amounts in the threshed grain reduce its usefulness for certain purposes, and this is directly reflected in the application of a dockage upon the price of bunt-infested wheat when it is presented for sale. Data collected in 1923, as a result of about 2,500 letters to elevators, are shown in Table 40. Forty-three counties are represented, and information is presented on more than three million bushels which represent 1/20 of the crop.

Table 40. Cash dockage on bunt-infected wheat for the 1923 crop in Illinois.

County	Bushels marketed	Bushels smutted	Bushels smutted & docked	Dockage per bushel	Total dockage
Adams	67000	0			
Bureau	59000	0			
Champaign	127214	1150	150	$0.05	$ 7.50
Christian	60000	850	850	0.05	42.50
Clinton	100000	5000	5000	0.05	250.00
Coles	35000	450	450	0.05	22.50
Douglas	30000	2000	2000	0.10	200.00
Edgar	15000	0			
Ford	9250	2500	2500	0.01	25.00
Greene	40000	(?) 3000	3000	0.02	60.00
Grundy	40000	0			
Henry	6750	0			
Iroquois	43100	8180	180	0.03	5.40
			1750	0.10	175.00
Kankakee	100000	5360	5000	0.05	250.00
Kane	1300	0			
Knox	42000	2000	2000	0.04	80.00
La Salle	44582	1300+	500	0.03	15.00
			800	0.05	40.00
Livingston	132092	15821	1781	0.02	35.62
			1390	0.035	48.65
			150	0.075	11.25
			10000	0.04	400.00
Logan	146300	400	400	0.025	10.00
Macon	80000	0			
Mason	38490	0			
McDonough	61000	0			
McLean	123670	9250	2250	0.02	45.00
			7000	0.05	350.00
Mercer	3000	0			
Monroe	40000	2000	2000	0.10	200.00
Morgan	40000	5800	1800	total loss	---

County	Bushels marketed	Bushels smutted	Bushels smutted & docked	Dockage per bushel	Total dockage
Montgomery	30000	423	423	$0.05	$ 21.15
Peoria	34848	650	500	0.01	5.00
Piatt	294000	25950	4000	0.03	120.00
			4200	0.035	147.00
			9500	0.05	475.00
			6000	0.07	420.00
			500	0.10	50.00
Putnam	40000	2000	2000	0.04	80.00
Randolph	11171	+	0		
Sangamon	149000	28200	2100	0.02	42.00
			7000	0.03	210.00
St. Clair	158100	10900	6200	0.11	682.00
			2200	0.06	132.00
Stark	3000	0			
Tazewell	150000	0			
Vermillion	60036	1000	1000	0.05	50.00
Wabash	130000	0			
Washington	17000	1000	500	0.03	15.00
			500	0.15	75.00
Warren	55500	8000	8000	0.045	360.00
Woodford	1350	0			
White	280000	0			
Whiteside	10000	0			
Will	93770	+	+	0.05	+
Total	3002523	143184 4.4%	105574 3.51%	Av.0.0488	$5157.57

It will be seen also that in many cases lightly smutted wheat has been received at elevators and mills without the application of dockage. Even then the majority of lightly smutted lots are passed by unnoticed.

Of the 3,002,523 bushels reported on, 143,184 bushels or 4.4% were sufficiently smutted to attract notice from purchasers, while 105,574 bushels or 3.51% were so badly smutted as to receive an average dockage of 4.88 cents.

The total dockage on the crop reported amounted to $5,157.57.

If the report may be taken as representing the crop of the state, of the 60,140,000 bushels produced 2,110,914 bushels would be docked at the rate of 4.88 cents per bushel, making a total cash dockage on the year's crop of about $100,000. This added to the estimated field loss would make a total money loss for the state of $2,375,000.

Considerable progress in the development of bunt-resistant varieties has been made during the past year. In the references below it will be seen that work is reported from four states, Michigan, Kansas, Washington and Oregon. One of the promising new varieties is "Ridit" developed at the Washington Experiment Station by E. F. Gaines, through the crossing of Turkey and Florence, the latter being a smut-resistant spring wheat introduced from Australia. Seven yield tests with this new wheat have given an average of 41.2 bushels an acre, while under the same tests the two leading winter wheats of Washington, Hybrid 128 and Turkey, produced 42.4 and 42.1 bushels per acre. Not more than 1/10% infection has been secured during 5 years of inoculation trials. The new variety has been distributed during the past year in one pound lots to hundreds of farmers.

Good results with the use of copper carbonate dusts and other new disinfectants have been secured by various workers during the year. (See section on seed treatment, page 248).

Recent literature (See also seed treatment section, page 248)

1. Clark, J. Allen. Ridit. *In* New varieties of wheat. Cereal Courier 15: 269. Sept. 30, 1923.
2. Coons, G. H. Varietal resistance of winter wheats to Tilletia laevis (Abstract) Phytopath 14: 38-39. Jan. 1924.
3. Gaines, E. F. Genetics of bunt resistance in wheat. Jour. Agr. Res. 23: 445-479. 1923.
4. Heald, F. D. and L. W. Boyle. Further notes on the relation of the spore load to the percent of stinking smut appearing in the crop. Phytopath. 13: 334-337. July 1923.
5. Johnston, C. O. Wheat bunt investigations in Kansas. (Abstract) Phytopath. 14: 37. Jan. 1924.
6. Munerati, O. Le basse temperature al momento della germinazione fanno sfuggire il grano all'attaco della carie? (Does low temperature at the time of germination enable wheat to escape bunt?) Atti R. Accad. Lincei Roma Redicônti Cl. Sci. Fis. Mat. e Nat. 32^{1}: 285-289. 1923.
7. Stephens, D. E. Table showing bunt-resistance of winter-wheat varieties tested at the Sherman County Branch Station, Moro, Oregon. Cereal Courier 15: 332-334. Nov. 10, 1923.

Loose smut caused by *Ustilago tritici* (Pers.) Jens.

Conditions were favorable for the occurrence of an unusual amount of loose smut in some of the Middle Atlantic States and in Michigan and North Dakota. In the remainder of the country, however, the disease was of about normal prevalence.

Table 41. Collaborators' estimates of percentage loss from loose smut 1923.

Percent loss	States
5	North Carolina
3	Pennsylvania, Maryland, Virginia, West Virginia, Indiana, Arkansas
2	South Carolina, Alabama, North Dakota, Idaho.

Percent loss	States
1/2	Kentucky, Mississippi, Ohio, Illinois, Michigan, Wisconsin, Iowa, Missouri, Kansas, Utah.
trace - 1	New York, Delaware, Texas, Minnesota.
trace	Massachusetts, Tennessee, Louisiana, South Dakota, Nebraska, Arizona, Washington, California.

A number of States report differences in varietal susceptibility. In New York 132 wheat fields in 32 counties were surveyed for wheat diseases and the following table (Table 42) prepared by R. S. Kirby shows the percentage of loose smut infection by varieties.

Table 42. Amount of loose smut in various wheat varieties in New York, 1923.

Variety	Number of fields surveyed	Average percent of loose smut
Forward	3	0.
No. 6 (Gold Coin)	96	.03
Dawson	24	2.
Red Rock	10	2.35
Mixture (usually) some No. 6 present)	43	.33
Honor	2	1.7
Fulcaster	2	1.7

In writing about this Kirby states, -

> "Surveys for the past three years have indicated that No. 6 wheat was resistant but in no case was the evidence so convincing as in 1923. That the 96 fields of this variety surveyed should only have an average of 0.03 percent strongly indicates the resistance of this variety. Another variety of wheat which apparently is showing marked resistance to loose smut is Forward. This variety was developed by the Plant Breeding Department of Cornell University and first given out for farm plantings in 1921. Loose smut was not found in two fields composed of 44 acres surveyed in 1922 or in three fields composed of 45 acres surveyed in 1923. The only record of loose smut in this variety is of one head found by Dr. H. H. Love in the 1923 increase plots at Ithaca. Other varieties of wheat such as Dawson, Honor (a Dawson selection), Red Rock, and Fulcaster have about two percent of loose smut on the average and apparently are not as resistant as the first two varieties."

In Virginia, Fromme noted again the high percentage of infection in bearded wheats as compared with smooth wheats. In 16 fields of bearded wheat an average of 3.65% loose smut was estimated.

WHEAT - Loose smut

In Ohio, the Trumbull variety continued to show marked resistance, and in Illinois, where about 150 fields were examined, Fulcaster rarely showed more than 1/2% while Harvest Queen (Red Cross), Stoddard County Pride, and Fultz were heavily infected. Kota and Monad in North Dakota and Dicklow in Idaho were reported very susceptible.

No outstanding work on loose smut control has been reported during the year, nor have any papers of great significance been published.

Flag smut caused by Urocystis tritici Kcke.

During 1925 flag smut of wheat was found in one additional State - Kansas, and in nine new counties in the States of Illinois and Missouri. In Illinois the State Department of Agriculture found the disease occurring in the new counties of Macoupin, Greene, Scott, Logan, and Hancock, and in Missouri the Plant Disease Survey cooperating with the Missouri State College of Agriculture discovered flag smut for the first time in St. Charles, Warren, Platte and Buchanan Counties. In Kansas infestations were found by men from the Plant Disease Survey and State Agricultural College in four counties in the northeastern part of the state, namely, Wyandotte, Leavenworth, Atchison and Miami.

In the majority of fields examined by Federal men during the year, only traces of flag smut were found. Usually only a few diseased plants could be found in the fields, but several cases were noted where the infestation was high especially in spots. In one field in St. Louis County an average of several counts showed 31% affected plants, in a portion of the field. Three heavily infested fields were located in St. Charles County, Missouri; and in Leavenworth County, Kansas, one field of Harvest Queen showed 15% smut in one-quarter of a twenty-acre field, while on another farm in the same vicinity 50% affected plants was observed in one corner of a large field. This is probably the highest percentage of infection that has been observed occurring naturally thus far in this country.

As a result of conferences held at Granite City, Illinois, May 25, and at Springfield, Illinois, May 29, it was decided that in view of the now apparent wide distribution of flag smut the restrictive measures of disinfecting wheat at the separator and regulating the movement of wheat from infested areas, be removed, and that in place of these, educational measures recommending the planting of resistant varieties and seed treatment be substituted. The notice of quarantine for Illinois has as its only requirements the regulating of the movement of wheat straw and the confining of threshing machines to limited areas within or near the quarantined zones. The programs for Missouri and Kansas were modeled along similar lines.

Recent literature

Tisdale, W. H., G. H. Dungan and C. E. Leighty. Flag smut of wheat, with special reference to varietal resistance, Illinois Agr. Exp. Sta. Bul. 242: 511-538. April 1923.

Tisdale, W. H., G. H. Dungan and C. E. Leighty. Flag smut of wheat. U. S. Dept. Agr. Circ. 273: 1-6. 1923.

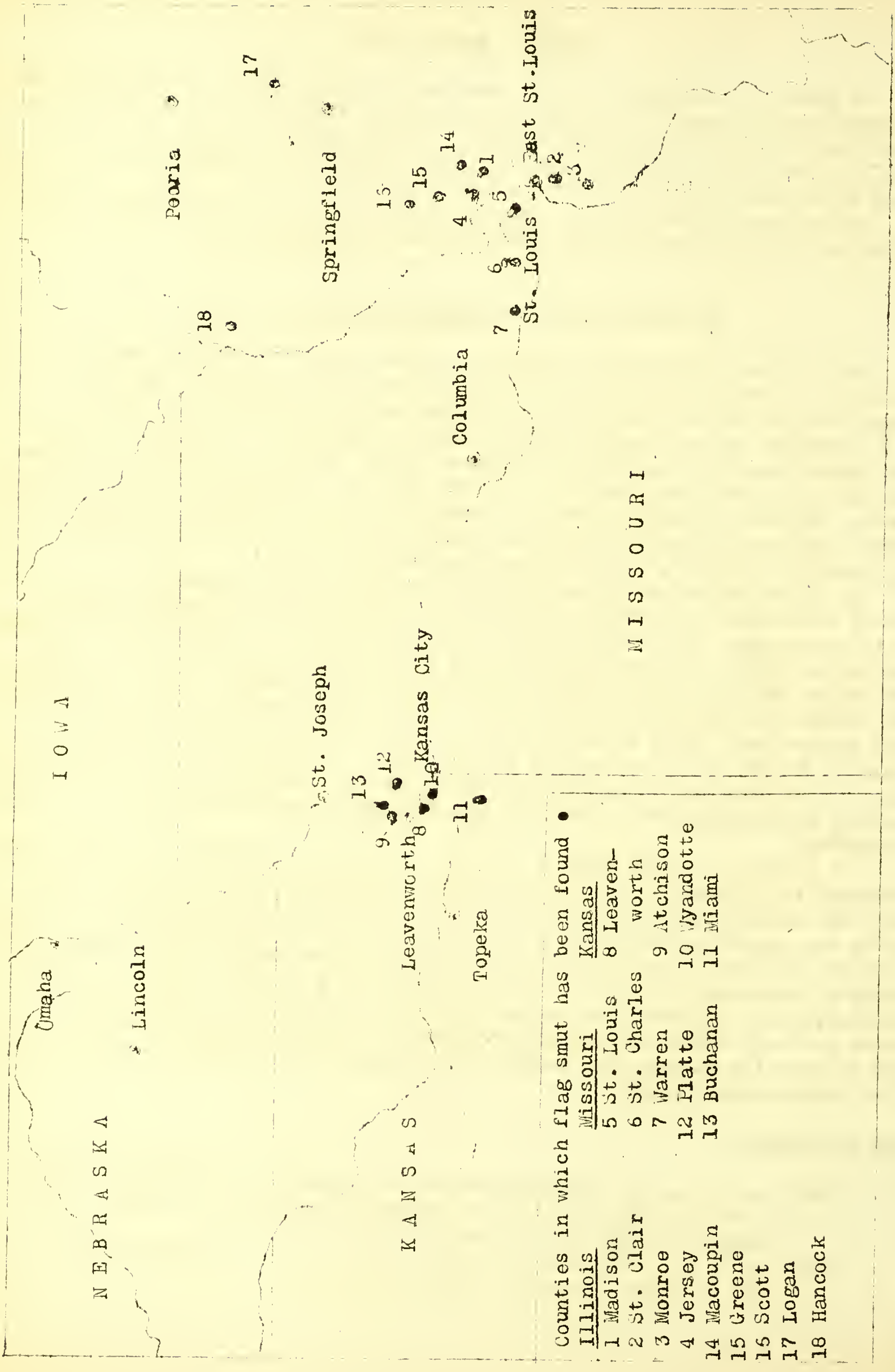

Figure 10. Distribution of flag smut of wheat in the United States by counties

Stem rust caused by Puccinia graminis Pers.

(Summary prepared by E. B. Lambert)

Distribution and losses:

In general the stem rust epidemic in 1923 was comparable to those of 1919 and 1920. It was, however, somewhat less severe. The rust was again much more serious in the spring wheat area than in the winter wheat regions. The relative prevalence of the rust, and the average percentage of loss for each state are indicated in Fig. 11. The losses in bushels for the more important spring wheat states are tabulated in Table 43.

Table 43. Losses from stem rust in spring wheat states, 1923, as reported by collaborators.

State	Estimated production, 1923. Bushels, (000 omitted)*	Estimated loss, 1923	
		Percent	Bushels (000 omitted)
Minnesota	20,785	15	3,118
North Dakota	58,650	12	7,039
South Dakota	26,906	10	2,691
Montana	52,486	18	9,447

*Production figures from Weather, Crops and Markets. December 29, 1923. p. 672.

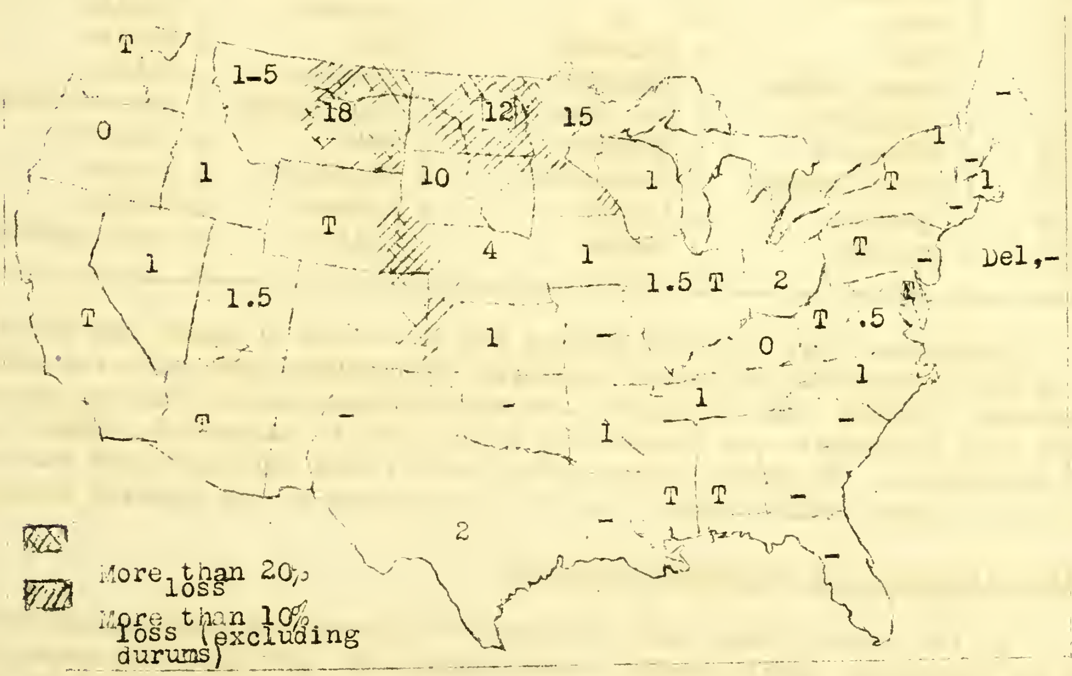

Fig. 11. Estimated average percentage loss from stem rust, according to collaborators, 1923.

Overwintering and first appearance:

Evidence of overwintering was obtained in Mexico and southern Texas only. Numerous observations were made early in the season. In so far as conclusions can be drawn from negative observations it would seem that the urediniospores did not overwinter in the Mississippi Valley north of central Texas.

The rust was first observed widespread in Texas and then increasingly farther north as the season progressed. Table 44 gives the first reports of primary field infection from the observations of state pathologists, members of the barberry eradication forces, and the men studying the epidemiology of stem rust under the direction of E. C. Stakman.

Table 44. First reports of stem rust not directly traceable to barberries - 1923.

Date	State	Town	County	Observer
...	Mexico	Piedras Negras		Ostrom
April 14	Texas	Castroville	Bexar	Butler
May 10	Oklahoma	Lawton	Comancho	Ostrom
May 26	Oklahoma	Stillwater	Payne	Ostrom
June 3	Kansas	-	Summers	Melchers
June 4	Illinois	-	Jackson	P. A. Young
June 4	Nebraska	-	Jefferson	Thiel
June 11	Indiana	-	Vanderburg	Frolik
June 15	Ohio	-	Preble	Frolik
June 20	Iowa	Atlantic	Cass	Butler
June 20	South Dakota	Yankton	Yankton	Thiel
June 22	Minnesota	St. Clair	Blue Earth	Christensen
June 23	Colorado	Cheyenne	Weld	Lungren
June 29	North Dakota	Christine	Richland	Mayoue
July 16	Wyoming	Laramie	Albany	Cotter
July 17	Montana	Plevna	Fallon	Christopher

Barberries were infected during the last week of April and the first week in May throughout the entire barberry eradication area with the exception of Montana, Wyoming and Colorado. The early appearance of rust on grain and grasses near barberries was especially noticeable in Wisconsin, Minnesota, and South Dakota. In these States fields were found infected near barberries from two to three weeks earlier than the appearance of the general epidemic.

Factors affecting the relative severity:

In the spring wheat area the rust was present in practically every field in Minnesota, North Dakota, South Dakota and Montana. The severity of the infection varied considerably, even in adjacent fields. This variation depended principally on the varietal susceptibility of the grain, and on the maturity and vigor of the stand when infected. Farther north in the Red River Valley at harvest time the rust was more severe, (see Fig. 11). This may be explained on the basis of difference in the periods between the time of infection and the maturity of the wheat. This period was a week to ten days longer in the northern part of the valley than in the southern part. It is interesting to note in this connection that rust was severe in Manitoba, Canada. The conditions in this province are summarized in the Canadian Plant Disease Survey Report for 1923, as follows:

> "Throughout the province rust was very serious, causing about 50% loss of the wheat that was harvested, amounting to a reduction of 35,000,000 bushels, or in money value from 15 to 35 million dollars. These losses were greater this year than any year since 1916."

The infection in Montana was also reported as being the most severe since 1916.

In the winter wheat regions stem rust losses were small except in an area centered around northeastern Colorado. This area, as indicated in Fig. 11, included a part of northeastern Colorado, northwestern Kansas, western Nebraska, and southeastern Wyoming. The heavy rust in that section seemed to be due to a delay in the maturity of the grain, resulting from a lack of snowfall during the previous winter and to drought during the early spring months. The average wheat field in that area did not mature until the second week in August, fully a month later than in eastern Nebraska. Rust was observed in this region on June 25. It therefore was able to increase locally for a month and a half before harvest.

In the remainder of the winter wheat region, a period of only two weeks existed between the time of the first widespread appearance of the rust and the harvest. Thus comparatively small losses resulted in the average wheat fields.

Barberry Eradication:

In the southeastern portion of the barberry eradication area throughout Michigan, Ohio, and Indiana, infections from barberries probably caused most of the severe damage. In the states of Illinois, Missouri, Kansas, Nebraska, Colorado, and Wyoming, and in the spring wheat area, it is probable that both wind-blown spores from points farther south, and spores from barberries were jointly responsible for the epidemic.

The epidemic this year was severe and widespread, especially in the spring wheat area. It is questionable whether the barberries found in the eradication area during the summer of 1923 constituted the only source of inoculum. A sufficient number of infected bushes and sprouts were found, however, to justify the conclusion that barberries must have been responsible for a considerable amount of early primary infection.

Furthermore the rust appeared generally in the fields of most localities fully a week later than in the last two seasons. Since weather conditions seemed ideal for early rust development, this delay may have been due to barberry eradication, and had the 5,000,000 bushes eradicated prior to 1923 still been in existence in the summer of 1923, the stem rust epidemic of 1923, which became very severe locally, might have become as generally severe and as tremendously destructive as the epidemics of 1904 and 1916.

The progress of barberry eradication in 1923 has been summarized by Dr. F. E. Kempton (4) as follows:

> "On December 31, 1923, the original property-to-property survey had covered 662 counties out of 894 requiring survey. These 662 counties contained 543,984 square miles, or 75.4 percent of the 721,831 square miles in the 894 counties originally requiring survey. In the calendar year January 1 to December 31, 1923, approximately 190 1/2 counties, or 177,058 square miles, have been covered in the original survey, at an approximate cost of $2.20 a square mile. In addition, 42 1/2 counties, containing approximately 36,000 square miles, have been covered in a second complete survey, and 361 counties have been covered in resurvey. During the year a total of 4,005,342 bushes, seedlings, and sprouting bushes were found and 3,967,738 destroyed in all surveys. The record for the six years to December 31, 1923, shows the enormous total of 10,073,667 bushes, seedlings, and sprouting bushes found and 9,379,774 destroyed."

Varietal susceptibility:

The rust races affecting Kota and Kanred wheat were unusually prevalent this year. Comparatively heavy infection of these varieties was noticed repeatedly in the field and in nursery plots.

Several papers dealing with the genetics of the inheritance of rust resistance have recently appeared as a result of cooperative work at the Minnesota Experiment Station.

Aamodt (1) reports progress in obtaining the rust resistance of Kanred wheat in a variety with the spring habit of Marquis. He states,

> "In the F_3 some hybrid families were homozygous for the spring habit of Marquis and for the rust resistance of the Kanred parent. ---- These facts further demonstrate that varieties of common wheat may be produced synthetically, which will be resistant to a large number of biologic forms of stem rust, Puccinia graminis-tritici."

Harrington and Aamodt (2) report the combination of different types of resistance from a Mindum - Pentad cross, as follows,

> "With the varieties of wheat used, it was found possible to combine, in a single variety, resistance to two biologic forms of stem rust of wheat, when crosses were made which reacted reciprocally to these rust forms."

Hayes and Aamodt (3) combined the resistance of Marquis to rust Form XIX and the immunity of Kota to Form XXVII, "in 3 families out of a total of 372 families studied."

> "In North Dakota wheat breeding and varietal experiments were studied at Fargo, Mandan, and Dickinson. Several promising F_5 rust-resistant strains of the Marquis x Kota cross, developed by L. R. Waldron, are being tested for the first time in field plats at Fargo and Dickinson. At Mandan a large population of F_3 and F_4 material of the Kota-Hard Federation cross was studied for rust and drought resistance. At Dickinson the most promising hybrids were strains of Marquis x Kanred and Kota x Kanred. One F_6 strain of Marquis x Kanred (1718 B 8-11) which ap-

pears to be the most promising, is being increased for growing in field plats and is being further selected. Nodak, a rust-resistant durum wheat, developed at Dickinson, is being further increased at the Dickinson Substation this year." (Cereal Courier 15: 201. August 20, 1923.

Literature:

Cited

1. Aamodt, Olaf S. The inheritance of growth habit and resistance to stem rust in a cross between two varieties of common wheat. Jour. Agr. Res. 24: 457-469. May 12, 1923.
2. Harrington, J. B., and O. S. Aamodt. The mode of inheritance of resistance to Puccinia graminis with relation to seed color in crosses between varieties of Durum wheat. Jour. Agr. Res. 24: 979-996. June 23, 1923.
3. Hayes, H. K., and O. S. Aamodt. A study of rust resistance in a cross between Marquis and Kota wheats. Jour. Agr. Res. 24: 997-1012. June 23, 1923.
4. Kempton, F. E. Progress of barberry eradication, 1923. Cereal Courier 16: 19-30. Jan. 31, 1924.

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Hansen, H. R. Severity of attacks of black stem-rust in Denmark. 1844-1921. Phytopath. 13: 404-407. 1923.

Hurd, A. M. Hydrogen-ion concentration and varietal resistance of wheat to stem rust and other diseases. Jour. Agr. Res. 23: 373-386. 1923.

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Stakman, E. C. Barberry eradication prevents black rust in western Europe. U. S. Dept. Agr., Dept. Circ. 269: 1-15. 1923.

Waterhouse, W. L. Some aspects of the wheat rust problem. Agr. Gaz. New South Wales 34: 381-387. 1923.

Leaf rust caused by Puccinia triticina Erikss.

The following summary by E. B. Mains is in accord with the information that has been received by the Survey.

> "Leaf rust has been less severe this season than in the previous two years. Although wheat varieties were late in maturing and the season has been very favorable for the disease, leaf rust was late in developing. In the middle of May very little rust was noted in Tennessee, Kentucky, and Indiana. However, by June 11 susceptible varieties at Knoxville, Tennessee, showed an infection of 100 percent. Certain varieties were beginning to ripen at this time. In most places rust evidently reached its maximum intensity only a short time before harvest. Consequently the loss from it is much less this year than usual. Apparently this is due in part to the more or less open winter characterized by such extreme fluctuations in temperature as to reduce very materially the amount of surviving leaf rust on wheat in the central portion of the eastern United States."

Practically all states east of the Mississippi reported much less leaf rust than last year, when the disease was epiphytotic over that area. In the cotton belt the estimated losses ranged from 1 to 5% (average 3%) in comparison with 1 to 15% (average 6%) in 1922. In the Atlantic States from Virginia northward about 1%, and in the Ohio Valley States from 1 to 4% reduction in yield is estimated (4% and 9% respectively in 1922). The Lake States report only a trace of damage, whereas in 1922 1% was estimated. West of the Mississippi, on the other hand, in Missouri, Iowa, Kansas, Nebraska, and the Dakotas, where leaf rust is ordinarily not so important, it was more prevalent than in 1922. In this group of States a reduction in yield of about 1% probably occurred.

Table 45. Dates of earliest recorded appearance of leaf rust, 1923.

Date	Place	Date	Place
March 8 (a single new pustule on volunteer wheat in a clover field)	Lexington, Ky.	May 14	Arlington, Va.
		May 31	Seaford, Del.
		June	Brookings, S. D.
		June 5	Ramsey Co., Minn.
April	Baton Rouge, La.	June 5	Lafayette, Ind.
April 15	Donalds, S. C.	July 5	Marion Co., Ohio.
April 17	Oktibbeha Co., Miss	July	Ft. Collins, Colo.
May 2	Ithaca, N. Y.		

Many collaborators mention the fact that the rust was later in appearing than usual and that it was largely because of this that the damage was less than usual. The delay has been attributed to unfavorable conditions for overwintering and to the cool weather of spring and early summer.

That progress is being made in the selection of resistant varieties is shown by the following note by H. S. Jackson and E. B. Mains (Cereal Courier 15: 206. 1923).

> "Varieties at Washington, D. C., Knoxville, Tenn., Experiment, Ga., La Fayette, Ind., and Madison, Wis., showed considerable variation as to susceptibility. As a group, the durums and emmers showed outstanding resistance to leaf rust. Among the bread wheats, Kanred,

several strains of Turkey, and Beloglina were fairly resistant. Malakoff (C. I. No. 4898), Imperial Amber (C. I. No. 4860), Democrat (C. I. No. 3384), Norka (C. I. No. 4377), and several unnamed spring wheats showed high resistance in some plantings and considerable susceptibility in others, apparently correlating with the distribution of the strains of leaf rust."

Literature:

1. Valleau, W. D. The oversummering of leaf rust of cereals in Kentucky. Phytopath. 13: 338-340. 1923.

Stripe rust caused by *Puccinia glumarum* (Schm.) Erikss. & Henn.

Slight amounts of stripe rust on wheat were reported from Idaho, Washington and California, but in no case was more than a trace of damage reported. Hungerford reported more of this disease than the average and more than in 1922, when it was very scarce.

An interesting and probably significant fact in connection with this disease is the discovery by E. C. Stakman of *Puccinia glumarum* in Mexico. During the first part of April he observed this rust occurring abundantly in Mexican wheat fields as far north as Saltillo in the state of Coahuila, which is about 180 miles southwest of the Texas border at Laredo. It will be seen that this Mexican infection is a possible source from which stripe rust may be introduced into the wheat fields of Eastern United States.

Two important contributions concerning this disease in this country have appeared during 1923,

1. Hungerford, C. W. Studies on the life history of stripe rust, Puccinia glumarum (Schm.) Erikss. & Henn. Jour. Agr. Res. 24: 607-620. May 19, 1923.
2. Hungerford, C. W., and C. E. Owens. Specialized varieties of Puccinia glumarum, and hosts for variety tritici. Jour. Agr. Res. 25: 363-401. Sept. 1923.

Fusarium blight (scab) caused by *Gibberella saubinetii* (Mont.) Sacc.

Less Fusarium blight (scab) of wheat than last year occurred in the Atlantic Coast States and in most of the Lake States, but more of the disease than in 1922 was reported from Tennessee, Arkansas, Indiana, Illinois, Missouri, Iowa, Nebraska, Minnesota, and South Dakota. It was not reported from a number of the southern States nor from States west of the 100th meridian.

Losses were reported as shown in table 46. It will be noted that considerable damage occurred in part of the spring wheat area. Concerning the losses in South Dakota, A. T. Evans says,

> "Ten percent seems high, but I feel confident it did that much damage everywhere. It did an immense amount of damage, many fields not being cut. Farmers thought rust did it."

WHEAT - Fusarium blight

Table 46. Estimated percentage reduction in yield of wheat due to Fusarium blight (scab), 1923.

Percent	State
10	South Dakota
5	Tennessee
4	Iowa
2	Pennsylvania, Illinois, Missouri
1	Maryland, West Virginia, North Carolina, North Dakota, Kentucky, Arkansas.
Trace	New York, Delaware, Virginia, Ohio, Indiana, Michigan, Wisconsin, Minnesota Nebraska, Alabama, Mississippi, Texas.

Table 47. Dates of earliest report of wheat scab, 1923.

Date	Place
May 20	Madison County, Illinois
June 23	Batavia, New York
June 24	Panola County, Mississippi
June 27	Madison, Wisconsin
June 28	McLeod, Minnesota
July -	Brookings, South Dakota
July 8	Fargo, North Dakota

The week ending June 19 was wet in parts of South Dakota, Nebraska, Minnesota, Iowa, Illinois, and Missouri, as was also the week ending July 3. It is not unlikely that the losses in these states are correlated with these rainy periods.

Collaborators in Kentucky made counts in about 1600 acres of wheat in 15 counties and found an average of about 20% infected heads. Although scab was most prevalent in wheat fields following corn in rotation, the opinion is expressed by the Kentucky collaborators that this may be due to deficient fertility rather than to a greater abundance of the organism.

Notes on varietal susceptibility:

Kentucky: Later varieties in some variety tests were much freer from infection, apparently escaping. (Valleau)

Illinois: Affected varieties have been Red Wave, Fultz, New Columbia, Fulcaster, Turkey 10-110, Turkey Red, Marquis, and Red Cross. Dungan reports none on Illinois No. 1, but 40% on White Australian spring varieties. (Tehon)

Minnesota: Marquis extremely susceptible, Preston and Haynes Blue Stem resistant. Common on winter wheat, especially Mintarki. (Sect. Plant Path.)

North Dakota: Early maturing varieties, such as Prelude, more commonly affected than later, common and durum wheats, this year. (Weniger)

South Dakota: Especially bad on durum wheat. (Evans)

References: (See also seedling blight, page 271)

1. Dickson, J. G. Influence of soil temperature and moisture on the development of the seedling blight of wheat and corn caused by Gibberella saubinetii. Jour. Agr. Res. 23: 837-870. 1923.
2. Dickson, James G. Sophia H. Eckerson, and Karl P. Link. Studies on predisposition of wheat and corn to seedling blight caused by Gibberella saubinetii. (Abstract) Phytopath. 14: 34. Jan. 1924.

Black chaff caused by Bacterium translucens undulosum S. J. & R.

Only traces of black chaff were reported from Arkansas, Wisconsin, Minnesota, Iowa, Montana, Colorado, and Idaho, but in the tier of states from Oklahoma and Kansas northward to the Dakotas and even into Manitoba and Saskatchewan considerably more black chaff than usual was reported. According to W. Weniger, North Dakota experienced its first real epidemic of black chaff. It was general over the state infecting the leaves, stems, and heads, and in some instances the heads were prevented from emerging. As high as 50% infected heads were observed in some fields and 20% loss was estimated in some cases. The average loss for North Dakota is placed at 5% or about 3,000,000 bushels. In South Dakota, A. T. Evans estimated about 1% reduction in yield. In Nebraska, G. L. Peltier, and in Kansas, L. E. Melchers reported the disease as very general throughout their states, but in neither state was it thought to be causing much loss.

R. O. Cromwell reported an abundance of the disease in North Dakota, southern Manitoba, southeastern Saskatchewan, Nebraska, south central Kansas, and north central Oklahoma, and makes the suggestion that this disease was possibly more serious than was generally supposed.

In all of these states farmers commonly confused this disease with the black stage of stem rust.

The variety Kota was mentioned as susceptible in Minnesota and North Dakota, Marquis in Minnesota, Kanred in Nebraska, and several of the amber durum wheats in North Dakota.

Take-all caused by Ophiobolus cariceti (Berk. & Br.) Sacc. (O. graminis Sacc.)

Ophiobolus on wheat was found in the following new localities in 1923, and during the year it was ascertained that the organism was collected in Maryland in 1920.

North Carolina -	Lincolnton, Statesville, Concord, Taylorsville,	Lincoln Co. Iredell Co. Cabarrus Co. Alexander Co.	
Tennessee -	Knoxville,	Knox Co.	(May 21)
Kansas -	Manhattan,	Riley Co.	
Oregon	Oregon City	Clackamas Co.	
California -	Davis,	Yolo Co.	
Saskatchewan, Canada -	One field in northern part of province.		

(Fraser, W. P. in - Survey of the prevalence of plant diseases in the Dominion of Canada, 1923. Fourth Annual Report.)

These occurrences add a province of the Dominion of Canada and three new states - North Carolina, Tennessee, and California, to the list of those from which the true take-all has been authentically reported. The other states are, New York, Maryland, Virginia, Arkansas, Indiana, Kansas, Oregon, and Washington. In summing up the information on the distribution of the disease, H. H. McKinney says -

> "Take-all is now known to occur in all of the wheat regions except the spring wheat belt. This may be explained on the basis of nonintroduction or possibly on account of climatic factors which may not wholly favor the parasite or the disease. Experimental work shows that spring wheats are susceptible to infection, thus eliminating a varietal explanation.
>
> "It should be noted that although the total area involved in the take-all infested areas is not large, the disease does occur in the most strategic locations from the standpoint of further distribution and future economic importance. It is established in the center of the hard winter wheat belt and it is gradually spreading.
>
> "Perithecial development varies considerably in different localities and during different seasons. Perithecia have been found to occur very sparsely in Kansas during the period that take-all has been observed in the state. In the vicinity of Corvallis, Oregon, fruiting bodies developed more abundantly in 1923 than was the case during 1921 and 1922 in adjacent fields. Perithecia developed very abundantly in North Carolina in 1923."

In New York 386 cereal fields in thirty-five counties were examined during the season, and concerning take-all R. S. Kirby, who made most of the inspections, reports in part as follows:

> "Take-all in 1923 was found in 42 of the 182 winter wheat fields surveyed. These forty-two infested fields were located in eleven countie as shown in Table 48.
>
> "During the 1923 survey, the area observed to be infested with take-all was smaller than that observed to be infested during the 1921 and 1922 surveys. This was shown by the fact that a total of

eighteen counties were known to be infested in the two years surveys of 1921 and 1922, but a resurvey of the same area in 1923 resulted in the finding of take-all in only the eleven counties nearest to the apparent center of the infested area.

Table 48. Counties and number of wheat fields in which take-all was found in New York during 1923.

County	Number of fields in which take-all was found	Total number of fields surveyed
Cayuga	16	21
Cortland	1	1
Genesee	5	15
Livingston	1	8
Monroe	3	8
Onondaga	1	2
Ontario	4	4
Oswego	1	3
Seneca	1	7
Tompkins	2	25
Wayne	7	8
Total 11 counties	42	102

"The average amount of plant killing or loss due to take-all in the infested area in 1923 was figured to be three-tenths of one percent. This is a marked reduction from the one and one-tenth percent found in 1922 and the two percent of killing occurring in 1921.

"The loss in 1923 was by far the least which has occurred during the past three years. This lack of severity of the disease was shown by the facts that the disease first appeared nearly two weeks later than in 1922, and that in 1923 the later infection caused less dwarfing of the plants with resulting greater difficulty in finding them. These marked differences in the amount of loss and killing apparently are due to the climatic factors. Thus in 1923 when there was the smallest loss there was a very late cool, dry spring and the same condition remained until harvest time. In contrast to the 1923 conditions, the spring and summer of 1922 until harvest time were wet and cool. Under these conditions the affected plants died earlier and the amount of stunting was somewhat increased over 1923. Further in contrast to the conditions in 1922 and 1923, in 1921 the exceptionally early wet spring was followed by a very dry summer accompanied by a very early killing of the infested wheat plants with the resulting extreme stunting and loss. Therefore weather conditions seem to be the large factor in determining the amount of loss. The weather conditions which seem to favor the disease are: early wet springs which are followed by dry, hot weather from the period of jointing until harvest. The early, wet springs seem to be less serious if the weather remains wet and cool until harvest time. Late, dry springs such as occurred in 1923 seem to be very unfavorable to the disease as shown by the reduction of this disease in the fields and also in plots here at Ithaca where there was considerably less disease present in wheat planted and inoculated in the same manner both years.

"A very striking example of the result of continuous wheat cropping was observed during the 1923 survey. In 1922 Dr. M. F. Barrus and the writer examined a ten acre wheat field just north of Auburn, N. Y., and found that there was only a trace of infection present. This year the same field was planted to wheat and an examination showed that there were at least ten percent of infected plants. So far as could be observed it still seems probable that the best method for the control of take-all in winter wheat is a four or five year rotation which includes one or two such crops as potatoes or corn where clean culture is practiced.

"From observations made during the past two years, it seems important that all wheat should be thoroughly cleaned before planting, as there is strong evidence that when the wheat is threshed by the common methods a small amount of inoculum which may result in a trace of infection in the next crop is carried with the seed as bits of infected straw."

References:

1. Mackie, W. W. Foot-rot or Ophiobolus in California. Phytopath. 13: 561-562. Dec. 1923.
2. Melchers, L. E. and M. C. Sewell. The rate of spread of wheat foot-rot in tillage plots in Kansas. (Abstract) Phytopath. 14: 41. Jan. 1924.
3. Rosen, H. H. and J. A. Elliott. Pathogenicity of Ophiobolus cariceti in its relationship to weakened plants. Jour. Agr. Res. 25: 351-358. Aug. 25, 1923.

Rosette (cause undetermined)

"This disease recurred in the experimental plats at Granite City, Illinois, in 1923, and the infestation was very severe in all plats sown with susceptible varieties. The disease was not severe in the experimental plats located at Wanatah, Indiana. Infested soils from Granite City and Wanatah gave a very high percentage of rosetted plants at Madison, Wisconsin. The cause of wheat rosette is still unknown. Inoculation experiments with Helminthosporium sativum have not yet produced rosette in the susceptible varieties. Additional experiments involving different methods are now being carried out in connection with this point.

"The mosaic-like leaf mottling associated with rosette recurred this year. This manifestation has a wider host range than rosette, however. The writer, in company with Dr. G. L. Peltier, inspected the wheat variety plats on the Nebraska Experiment Station farm at Lincoln and a considerable amount of leaf mottling was found. This mottling is indistinguishable from that occurring in the Granite City, Illinois, region. No varieties known to be susceptible to

> rosette were growing in the plats so it was not possible to make observations on this manifestation." (H.H. McKinney)

The wheat in two fields in Illinois, one in Cass County and the other in Logan County, was reported infected by Dungan and Tehon. This is probably a fewer number of infestations in Illinois than has been reported any year since the disease was first discovered in 1919.

Literature:

1. McKinney, H. H. Investigations of the rosette disease of wheat and its control. Jour. Agr. Res. 23: 771-800. 1923
2. McKinney, H. H. and W. H. Larrimer. Symptoms of wheat rosette compared with those produced by certain insects. U. S. Dept. Agr. Bul. 1137: 1-8. 1923.
3. Webb, R. W., C. E. Leighty, G. H. Dungan, and J. B. Kendrick. Varietal resistance in winter wheat to the rosette disease. Jour. Agr. Res. 26: 261-270. Nov. 1923.

Other foot and root rots

1. Wojnowicia graminis (McAlp.) Sacc. & D. Sacc. H. H. McKinney has summarized the situation with regard to this fungus:

> "This fungus has been found in several other footrot infested areas associated with and independent from Ophiobolus graminis. Inoculation studies show that the fungus is a parasite, producing symptoms on seedlings which bear certain resemblances to the symptoms produced by Ophiobolus graminis and Helminthosporium sativum. It is not known just how aggressive Wojnowicia graminis may be under various field conditions."

Concerning the fungus in New York, R. S. Kirby reports as follows -

> "This pathogene on wheat was first observed at Ithaca on May 23, at which time mature pycnidiospores had been formed. During the survey the disease was found in five counties, four of which are new locations. It was found in two counties quite remote from the take-all infested area which shows that it is not always associated with it. This pathogene was also observed on Agropyron repens at Ithaca on July 19. The infected grass was growing in drill rows with diseased wheat."

2. Sclerotium rhizodes Auersw. This fungus was reported to the Survey from the state of Washington on July 7 for the first time. The report was later substantiated by specimens. Regarding it F. D. Heald says,

> "Large patches in a field of winter wheat at Chelan were killed by Sclerotium rhizodes, which produced an abundance of sclerotia in the dead leaves."

WHEAT - Foot and root rots

More information about the occurrence in Idaho in 1922 has recently been given. (Hungerford, Chas. W. A serious disease of wheat caused by Sclerotium rhizodes in Idaho. Phytopath. 13: 463-464. Oct. 1923.)

3. An undetermined foot rot was reported occurring again in Spokane County, Washington, by F. D. Heald. It was first noticed this year about May 20 at Freeman, in Spokane County. Wojnowicia graminis has been found associated with this disease by members of the Office of Cereal Investigations.

4. A foot rot of wheat in Oklahoma has been found to be associated with a fungus of the Helminthosporium or Brachysporium type. (McKinney, H. H. An undescribed inperfect fungus associated with wheat foot rot in Oklahoma. (Abstract) Phytopath. 14: 34. Jan. 1924)

5. Root rots associated with Fusaria were reported from New York, Minnesota, North Dakota and Oregon. In New York they were of only slight importance as they were never found affecting more than a few plants in a field. In Minnesota, however, where seedling blight was prevalent, it was rated as of considerable importance, causing a loss of perhaps one-half of one percent.

References:

1. Rose, Jessie P. Fusarium culmorum in Oregon, its varieties and strains that cause disease of cereals and grasses. (Abstract) Phytopath. 14: 49. Jan. 1924.
2. Rose, Jessie P. Fusarium culmorum var. leteius, a cause of disease in cereals and grasses. (Abstract) Phytopath. 14: 50. Jan. 1924.

6. Seedling blight caused by Helminthosporium sativum P. K. & B. and other species of Helminthosporium. New York, Minnesota, Iowa, Kansas, and North Dakota reported this disease.

New York: This disease apparently caused the greatest damage to the wheat before it began to joint. During May the disease resulted in some killing in nearly all fields observed but after the wheat began to joint the disease, while nearly always present, did not seem to cause any appreciable damage. (R. S. Kirby)

Minnesota: Common throughout the state but only slight infections on heavy soils. On sandy soil, on the other hand, much damage occurred, the yield being decreased 25-50%. (Sect. Plant Path.)

Reference:

McKinney, H. H. Influence of soil temperature and moisture on infection of wheat seedlings by Helminthosporium sativum. Jour. Agr. Res. 26: 195-218. Nov. 1923.

WHEAT - Nematode

Nematode - Tylenchus tritici (Stein.) Bast.

Only a few slight infestations of wheat nematode were reported from Virginia, West Virginia, and North Carolina this year. No new occurrences were recorded.

Reference:

Goodey, T. Quiescence and reviviscence in nematodes, with special reference to Tylenchus tritici and Tylenchus dipsaci. Jour. Helminth. 1: 47-52. May, 1923.

Anthracnose caused by Colletotrichum cereale Manns

New York, Pennsylvania, Maryland, Virginia, Kentucky, Ohio, Indiana, and Illinois reported this disease on wheat. R. C. Thomas, in Ohio, states that the losses were much less than in 1922, and were most pronounced in the southern and western part of the state. C. T. Gregory reports the disease as widespread in Indiana and serious in Posey County. In some wheat fields, areas of dead plants up to 30 feet in diameter were found. The use of old wheat straw as a winter mulch is thought to be favorable. L. R. Tehon, of Illinois, writes that for the first time, at least in recent years, anthracnose was serious in the state as a whole and in some localities it was the most important wheat disease.

Glume blotch caused by Septoria nodorum Berk.

The majority of the states east of the Great Plains Region report some of this disease, but only along the southern border of the winter wheat belt was appreciable damage reported. It is still a question as to how much loss this disease is capable of causing, it being maintained by some that Septoria infection of the glumes does not decrease the yield. This may be true under certain conditions, but does it hold for all conditions, and what are the influencing factors? That some collaborators consider the disease of economic importance is shown by the following estimates of losses in 1923: North Carolina and Arkansas each 4%, Kentucky and Alabama each 1%, Kansas 0.5%, and New York 0.3%.

Speckled leaf blotch caused by Septoria tritici Desm.

Judging from the reports sent in, this disease of wheat leaves was more prevalent than usual in the corn belt states from Indiana westward to Nebraska and Kansas. Reports from Arkansas and Georgia also indicate more than usual, but in the other states it was not particularly noticeable.

This disease is usually one of the first of the season to put in an appearance. It often affects the wheat in the rosette stage, commencing with the lower leaves and progressing upward onto the culm leaves.

Ergot caused by Claviceps purpurea (Fr.) Tul.

Twenty-one collaborators in as many widely scattered states reported that ergot had not been found on wheat in 1923. In New York, where a considerable number of wheat fields were examined for diseases, a bare trace was found. In Minnesota also a trace was reported, and in North Dakota, where on occasion ergot has been serious on durum wheat, much less was reported than last year or the average year. W. Weniger makes the following statement -

> "The last epidemic (in North Dakota) occurred in 1921, when many lots of threshed samples of amber durum from the Red River Valley contained 10% and more of ergot bodies."

Powdery mildew caused by Erysiphe graminis DC.

Slight amounts of powdery mildew occurred in many of the humid eastern states. The only losses that are reported are from New York and Maryland, where one-half percent reduction in yield is estimated.

Literature:

Mains, E. B. Wheat resistant to mildew, Erysiphe graminis. (Abstract) Phytopath. 14: 48. Jan. 1924.

Downy mildew caused by Sclerospora macrospora Sacc.

This wheat disease, hitherto reported in this country only from Kentucky, Tennessee, and California, was found in 1923 for the first time in Delaware. On June 25, J. F. Adams of the Delaware Experiment Station noted the disease and collected specimens of affected Red Rock and Miracle wheat from a low area in the experimental plots at Newark. The seed of the former variety came from the Pennsylvania Agricultural Experiment Station and that of Miracle from Landisville, Pennsylvania. Plants of Pennsylvania 44 and Leap's Prolific in adjacent plots showed no downy mildew. Specimens which were submitted to Washington for identification are on file in the Pathological Collections, of the Bureau of Plant Industry.

Other diseases.

Bacterium atrofaciens McCulloch, causing basal glume rot of wheat was reported from Nebraska and Montana in 1923.

Bacterium alboprecipitans Rosen. According to H. R. Rosen (A bacterial disease of foxtail (Chaetochloa lutescens). Ann. Missouri Bot. Gard. 9: 333-402. Nov. 1922) this organism has never been found occurring naturally on wheat, but infections have been produced artificially by Rosen on at least twenty-seven wheat varieties.

Stripe (undet.) was reported from nine counties in New York. It was confined almost wholly to the variety No. 6, according to Kirby, and was first observed June 14. This is a leaf disease that has been reported from New York almost annually for several years now, but which has not been recognized definitely in many of the other states.

Black point associated with Helminthosporium sativum occurred to some extent in the Red River Valley of North Dakota, according to W. Weniger.

RYE

Stem rust caused by *Puccinia graminis* Pers.

During the season of 1923 stem rust caused only slight loss in rye. Few states reported more than a trace. Ohio reported a loss of 2 percent, Massachusetts, Connecticut, and South Dakota 1 percent, North Dakota .5 percent, New York and Wisconsin .1 percent. A trace of loss was reported from Maryland, West Virginia, Georgia, Indiana, Illinois, Michigan, Minnesota, Iowa, Nebraska, Kansas, Colorado, Texas, Idaho, Washington, and Oregon.

The worst damage occurred in Ohio, where the disease was severe in local areas of the southern and eastern parts of the state. Primary infection was traced to barberries in some cases in New York and Minnesota.

Leaf rust caused by *Puccinia dispersa* Eriks.

Rye leaf rust as usual occurred widely over the United States. Like the leaf rust of wheat it was less severe than in 1922 in the majority of the states east of the Mississippi River and, owing to climatic conditions, was late in developing.

This is regarded as the most serious rye disease in many states, but for the country as a whole it is probably secondary to stem rust. In some states it was less important than anthracnose and in others less serious than ergot.

Table 49. Estimated losses from leaf rust of rye, according to collaborators, 1923.

Estimated loss (percent)	States
6	Massachusetts
3	Arkansas, Ohio
1	Connecticut, New York, Maryland, Virginia, Georgia, Illinois
0.5	South Carolina, Alabama
Trace	West Virginia, Kentucky, Tennessee, Mississippi, Louisiana, Indiana, Michigan, Wisconsin, Minnesota, Iowa, North Dakota, Kansas.

The following statements relating to overwintering may be of significance:

New York: Overwintered at Ithaca as open uredinia, and during May and early June increased from a trace to an average of 10% infection. (Kirby)

Delaware: Heaviest infection on volunteer growth. (Adams)

Kentucky: Very little overwintered on volunteer plants heavily rusted in the fall. Plants carefully observed all winter showed none in the spring. (Valleau)

Minnesota: Winter rye in southern counties infected later than in more northern part of state. Not common in south until latter part of June. (Sect. Plant Path.)

RYE - Leaf rust

Table 50. Dates of earliest observation, 1923.

Date	Location	County	State
April	Baton Rouge	East Baton Rouge	Louisiana
April 26		Coahoma	Mississippi
April 26	Columbia	Brown	South Carolina
May 2	Ithaca	Tompkins	New York
May 5	Houston	Kent	Delaware
May 22		Chisago	Minnesota
June	Riley	Riley	Kansas
June [illegible]	Fort Collins	Larimer	Colorado
June 4		Jackson	Illinois
July 1	Washington	Litchfield	Connecticut

Reference:

Mains, E. B. Resistance in rye to leaf rust, Puccinia dispersa Erikss. Jour. Agr. Res. 25: 243-252. Aug. 1923.

Anthracnose caused by Colletotrichum cereale Manns.

New York, Virginia, South Carolina, and Mississippi report more anthracnose than in the average year while Ohio, Wisconsin, and Minnesota report the same as usual. It was not observed in the Dakotas. In New York, Virginia, Mississippi, and Ohio this was regarded as the most serious rye disease of the year, causing 1% loss in New York and 10% and 15% in Mississippi and Ohio respectively. South Carolina losses were estimated at 2%.

Table 51. Dates of earliest observation, 1923.

Date	Location	County	State
April 24		Oktibbeha	Mississippi
April 26	Columbia	Richland	South Carolina
June 2	Ithaca	Tompkins	New York
July 10	Waupaca	Waupaca	Wisconsin
July 10		Moore	Minnesota

Ergot caused by Claviceps purpurea (Fr.) Tul.

The only state reporting more ergot than usual or more than last year was Iowa. In the other states, especially those important in rye production such as North Dakota, Michigan, Minnesota, and Wisconsin, there was about the average, or perhaps less than the average amount. Comparatively dry weather at blossoming is mentioned by a number of collaborators. The losses from ergot for the country as a whole were very slight, being estimated at less than one percent in all states. Probably the disease did as much damage in Iowa and the Dakotas as anywhere. Occurrence on volunteer rye was mentioned specifically by a number of collaborators.

Stem smut caused by Urocystis occulta (Wallr.) Rab.

No new facts about the geographical distribution of this disease were obtained during the year except that it was reported for the first time from Ashland County in northern Wisconsin. According to R. E. Vaughan this is the first report from this section of the state. In general the disease was of only slight importance, although there are reports from several states of severe localized infestations. Thus, one field near Bridgewater, Virginia, showed 10% loss; infections of 20% were seen in two fields in Hancock and Christian counties, Illinois; E. A. Bessey reported a field near Battle Creek, Michigan with 10%; and as high as 20% infection was observed in Minnesota.

Regarding the importance of this disease in New York, R. S. Kirby says,

> "The stem smut of rye, while not the most destructive disease of this crop throughout the entire state where it only caused .08 percent loss, nevertheless is an important disease of rye in the Hudson Valley. It is very likely that a careful survey of the principal rye growing region of New York State made before the plants head would reveal the fact that nearly one percent of the plants are infected with this smut."

Head smut caused by Ustilago tritici (Pers.) Jens.

This disease was collected in Kentucky for the first time and a single head was found June 7 in Cottonwood County, Minnesota. The Kentucky collections, a part of which were sent to Washington, were made by W. D. Valleau at Harrodsburg, Mercer County, about May 22. He found some specimens in a field of wheat that showed between 17 and 20% loose smut, and others were obtained from the edge of a field of rye more than a mile away from the wheat field.

Fusarium blight (scab) caused by Gibberella saubinetii (Mont.) Sacc.

Traces of this disease were reported only from New York, Ohio, Illinois, Wisconsin, Minnesota, Iowa, and North Dakota, and several of these states report less than last year. Dry weather at the critical periods is given as the cause for the reduced amount.

Other diseases

Bunt caused by Tilletia tritici (Bjerk.) Wint. - Since the last annual summary on cereal diseases a paper has appeared by E. F. Gaines and F. J. Stevenson (Occurrence of bunt in rye. Phytopath. 13: 210-215. May, 1923) giving further information concerning bunt in rye. In the fall of 1921 they found it occurring naturally on one plant of common rye, one F_2 plant of a rye-wheat hybrid, and two F_2 plants of a wheat-rye hybrid. Artificial inoculations showed that at least four varieties of rye are not immune and that several wheat and rye hybrids are susceptible.

Powdery mildew caused by Erysiphe graminis DC. was reported only from New York, Maryland, Michigan, Minnesota and Idaho. No appreciable damage occurred in any state.

Leaf spot caused by Helminthosporium sativum P, K. & B. was reported from New York (slight) and Minnesota (trace found, no damage.)

Bacterium albopraecipitans Rosen (Rosen, H. R. A bacterial disease of foxtail (Chaetochloa lutescens) Ann. Mo. Bot. Gard. 9: 333-402. Nov. 1922). Artificial infection of five varieties of rye is reported. It has not been found occurring naturally on rye, however.

BARLEY

Covered smut caused by Ustilago hordei (Pers.) K. & S.

Some of the eastern and Ohio Valley states reported more covered smut than last year, but the other states, including those that are most important from the standpoint of barley production, reported about the same as or somewhat less than in 1922. The highest loss estimated was 6% for Kentucky. This was followed by 2% in Maryland and Kansas, 1.5% in Delaware, 1% in Vermont, Connecticut, Virginia, Tennessee, Mississippi, North Dakota, Iowa, and Idaho, and approximately 0.5% in New York, Texas, and Colorado. Some high percentages were noted in individual fields; thus 22% was observed in Delaware, 20% in Kentucky and in Mississippi, and 10% in each of the Dakotas.

The following note from Fairbanks, Alaska is of interest:

> "Barley is the principal crop raised in this district. The only disease of any importance at all was covered smut. I found an average of 16% on the Station Farm this year. It is not as prevalent on the other farms but would average nearly 5%." (Glenn E. Baxter, Aug. 6, 1923)

(See "seed treatment" for control)

Reference:

Tisdale, W. H. An effective method of inoculating barley with covered smut. Phytopath. 13: 551-554. Dec. 1923.

Loose smut caused by Ustilago nuda (Jensen) K. & S.

In New England, New York, Virginia, Georgia, Mississippi, and Indiana this was listed as the most important barley disease. In California, which in 1923 stood first in barley production, this smut was reported especially severe in Orange and San Diego Counties in the Salinas Valley, where it occurred in spots to the extent of 15%. In Arizona, according to J. G. Brown, it was bad in Apache and Yavapai Counties, 8% infection being reported in the latter county. There follow some of the estimates of losses: 5%, Virginia; 3%, Georgia and Kansas; 2.5%, Illinois and Kentucky; 2%, Massachusetts, New York, Maryland, Mississippi; 1%, Vermont, Connecticut, Minnesota, Iowa, North Dakota, South Dakota, and Tennessee. Infections of 47% and 20% were noted in individual fields in Indiana and South Dakota respectively, and 10% was observed in Illinois, Minnesota, and North Dakota.

Collaborators in Minnesota report the variety Lion very susceptible. (See "seed treatment" for control).

Stem rust caused by Puccinia graminis Pers.

This year stem rust of barley was of economic importance in eight states only. Losses were reported as follows:

State	Percent	State	Percent
Connecticut	.5	Iowa	4
New York	1.	North Dakota	3
Ohio	.5	South Dakota	5
Wisconsin	1.	Colorado	5
Minnesota	1.5		

Of these states, Minnesota, North Dakota, South Dakota, and Wisconsin are among the six leading producers of barley.

In Minnesota infection was first observed on June 23. The rust was general but caused severe losses only in the northern part of the state. Reports from North Dakota indicate that, although the infection was general, the loss was reduced by early ripening. In South Dakota the infection reached 10% to 50% in all fields, and many were a total loss. This condition was attributed to exceptionally moist weather in June. The loss in Iowa (4%) was less than has been reported for the average season.

In the leading barley states, California and Kansas, the disease was present but insignificant.

Leaf rust caused by Puccinia simplex (Koern.) Erikss. & Henn.

Slight amounts of barley leaf rust were reported from New York, Kentucky, Ohio, Indiana, Illinois, (found only once in Ogle County), Michigan, Wisconsin, Minnesota, Iowa, Nebraska (observed for first time since 1920), and Colorado. It was common in many of the barley areas in the Sacramento Valley and southern part of California, according to W. W. Mackie. Valleau (1) has recently presented evidence that this rust may oversummer and overwinter on volunteer barley plants in Kentucky.

Reference:

1. Valleau, W. D. Oversummering of leaf rust of cereals in Kentucky. Phytopath. 13: 338-340. 1923.

Stripe caused by Helminthosporium gramineum Rab.

Stripe was about as prevalent as usual in most states, although in Illinois L. R. Tehon estimated that it was above the average. Specimens were received from Zainesville, Texas. The disease has been reported from Texas before, but these are the first specimens to accompany reports from that state.

Table 52. Losses from stripe as estimated by collaborators, 1923.

Percent loss	State
5	Iowa
3	Illinois
2	Colorado
1	Indiana, Minnesota, North Dakota, South Dakota
Trace	New York, Delaware, Maryland, Virginia, Mississippi, Louisiana, Wisconsin, Nebraska, Idaho, Washington.

Reports of earliest observation, 1923:

June 1	Ithaca, New York
June 8	Charleston, South Carolina
June 10	Madison, Wisconsin
June 15	Redwood Falls, Minnesota

Progress has been made in the control of this disease. (See seed treatment, page 248)

Reference:

Johnson, A. G., R. W. Leukel, and J. G. Dickson. New seed treatments for controlling stripe disease of barley. (Abstract) Phytopath. 14: 42, Jan. 1924.

Spot blotch caused by Helminthosporium sativum P. K. & B

Spot blotch occurred widely and was of some importance in states like New York, Minnesota and the Dakotas. Practically all of the states reporting mentioned it as about the same as last year and about as usual. Delaware and Wisconsin report satisfactory results with the use of organic mercury compounds in controlling this disease.

Net blotch caused by Helminthosporium teres Sacc.

This disease was probably less serious than the spot blotch in most of the barley states, which, for the most part, reported about the same amount as last year. New York, however, estimated slightly more, with a trace of loss, and Iowa estimated considerably more with about 5% reduction in yield. One field was noted in Minnesota with nearly 50% of the plants killed and 10% infection was observed in both North and South Dakota.

Other diseases

Stripe rust caused by Puccinia glumarum (Schm.) Erikss. & Henn. None of this rust was reported on barley to the Plant Disease Survey, although it was reported on Hordeum jubatum and on wheat from some of the western states.

Scald caused by Rhynchosporium secalis (Heins.) Davis. Wisconsin, Iowa, Idaho, Washington, and California were the only states reporting scald and in most of these it was apparently of very slight importance.

Foot rot caused by Ophiobolus cariceti (Berk. & Br.) Sacc. Mature perithecia of this fungus were found at Davis, California, and in 1922 H. H. McKinney found barley attacked west of Riverside, California. (W.W.Mackie. Footrot, Ophiobolus in California. Phytopath. 13: 561-562. Dec. 1923.) In New York a careful examination of about 50 barley fields within the take-all infested area was made by R. S. Kirby without finding any infected plants. The observations in that state, up to the present, indicate that for some reason barley escapes infection.

Helminthosporium californicum Mackie & Paxton. A new Helminthosporium disease of barley in California has been described during the past year. (Mackie, W. W., and G. E. Paxton. A new disease of cultivated barley in California caused by Helminthosporium californicum n. sp. Phytopath. 13: 562. Dec. 1923)

Ergot caused by Claviceps purpurea (Fr.) Tul. Traces found on barley in New York, Minnesota, and North and South Dakota.

Anthracnose caused by Colletotrichum cereale Manns was found on Alpha barley at Ithaca, New York, August 1.

Powdery mildew caused by Erysiphe graminis DC. was reported from a number of the eastern states. In Delaware, Adams reports it severe on spring and winter barley, even on the rosette leaves, while adjacent wheat fields showed no infection.

Fusarium blight (scab) caused by Gibberella saubinetti (Mont.) Sacc. New York, Ohio, North Dakota, Iowa, and Nebraska report some of this disease. More than usual occurred in the two last named states. In Iowa a loss of 2% is estimated and in Nebraska it was much more common on barley than on wheat.

Pink root caused by Fusarium sp. was severe in Los Angeles, Orange, and San Diego Counties, California, according to W. W. Mackie.

Bacterium alboprecipitans Rosen can infect barley as shown by artificial inoculation tests. It has not been found occurring naturally on barley, however. (Rosen, H. R. A bacterial disease of foxtail (Chaetochloa lutescens). Ann. Missouri Bot. Gard. 9: 333-402. Nov. 1922.)

OATS

Smut caused by Ustilago avenae (Pers.) Jens. and U. levis (K. & S.) Mag.

Of the thirty-four states reporting on the relative prevalence of oat smut, one-half or seventeen reported it as of almost the same prevalence as last year, while nine reported less, and the remaining eight reported more than in 1922. These differences, although governed somewhat by environmental factors, are in part due to differences in the amount of seed treatment in the various states. Thus, Arkansas and Illinois report a falling off in the amount of seed treatment in the last few years, while in Ohio and Idaho the disease is said to be decreasing each year owing to the widespread practice of seed treatment and interest in seed improvement. On account of the ease in controlling these diseases, and the publicity that has been given the various seed treatment methods, it is natural to expect a decline in severity until the loss becomes negligible. Although there is probably a steady trend in this direction, the disease will always be present in considerable quantities owing to the fact that farmers are inclined to stop treating when smut is of no consequence and resume treatment only when it becomes serious.

As usual the smut diseases taken together constituted the most important disease factor influencing the yield of oats in the United States as a whole. The estimated losses by states are shown in Fig. 12. Kirby, in New York, distinguished between the two smuts and as a result of many field examinations estimated 3.14% loss from Ustilago avenae and 0.83% from U. levis. Glenn E. Paxton reported 2% of each smut occurring in the vicinity of Fairbanks, Alaska in 1923.

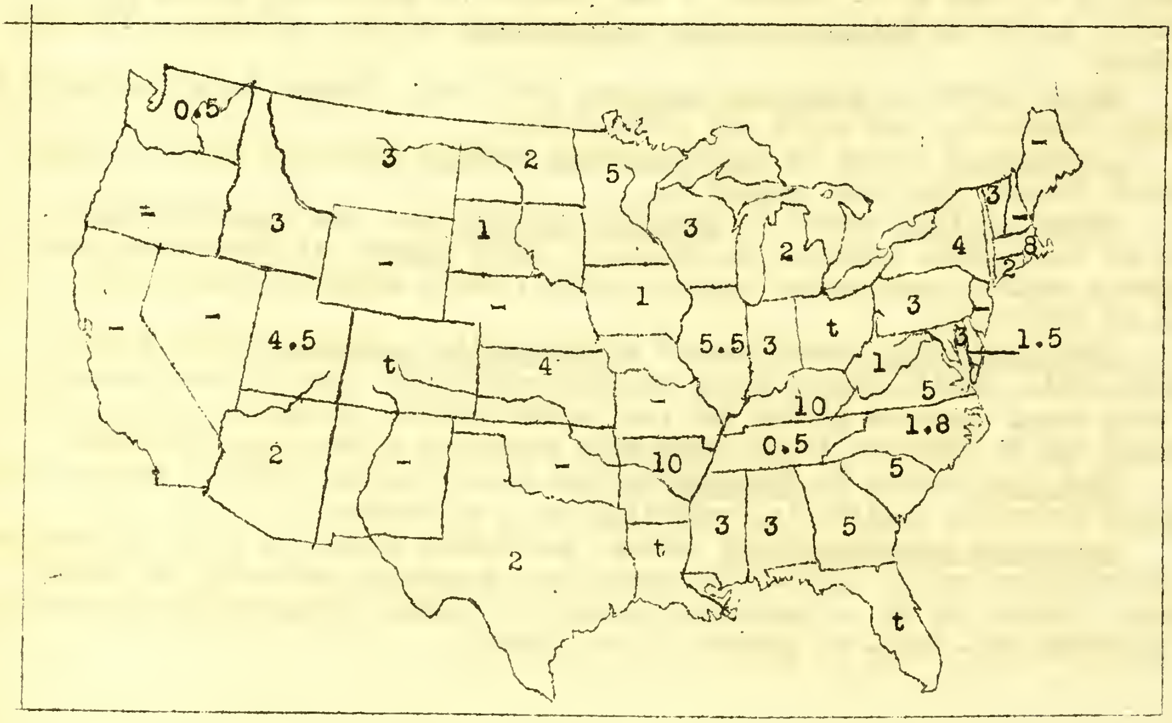

Fig. 12. Estimated percentage losses from the smuts of oats, 1923.

Some of the highest percentages found in individual fields were 60% Minnesota, 48% Wisconsin, 40% New York, 30% Illinois, 25% Mississippi, 20% Virginia 15% Indiana, 12% New Jersey and Alabama, and 10% North and South Dakota.

The following note from New York regarding the relation of time of planting to smut infection is of interest.

> "The cold, dry weather in March and April delayed the planting of oats in general for several weeks. This difference in the time of planting had a marked influence in one case, at least, on the amount of smut. Samples of the same seed were planted early in April at Ithaca and late in April at Albion. The percentage of smut at Ithaca was 10 percent as compared with 44.1 percent at

Albion. It was further noticed that in certain fields there was a higher percentage of smutted heads in the lower areas. In one field in Tompkins County there was 18 percent of smut in the oats in the low, poorly drained areas while there was only 9 percent on the higher, drier ground." (R. S. Kirby)

Table 53. Dates of earliest observance of oat smut, 1923.

Date	Place	Date	Place
March	Central Florida	June	Fort Collins, Col.
April	Baton Rouge, La.	June 6	Saline County, Ill.
April 24	Attala County, Miss.	June 7	Seaford, Del.
May	North Carolina	June 22	Steuben County, N. Y.
May 3	Denmark, S. C.	June 27	Monmouth County, N. J.
May 28	Sibley County, Minn.	July 3	Mt. Carmel, Conn.
June	Webster, S. D.		

Resistant varieties:

The only note on oat varieties resistant to smut received during the year is that from the Cereal Courier (15: 66. April 30, 1923) which reads as follows:

> "Dr. E. F. Gaines, of the Washington Agricultural Experiment Station, Pullman, Washington, during the past winter has discovered that the unnamed variety of oats which he has been carrying under C. I. No. 357-1 is immune to covered smut. In addition, he states in a recent letter to the Office of Cereal Investigations that it has produced a higher average yield than any other oat variety during the 4-year period from 1919 to 1922, inclusive, at Pullman. As this is the first variety of yellow or yellowish-white oats discovered so far that has shown immunity to covered smut, this fact makes it of considerable interest. Doctor Gaines obtained it from the Sherman County Branch Station at Moro, Oregon, in 1919.
>
> "This oat has been grown in the varietal experiments at Moro since 1914, where it has been the highest yielding variety. Because of its high yield, D. E. Stephens, superintendent, distributed it to farmers in Sherman County, Oregon, several years ago under the name of 'Carleton.' As it is now grown commercially to a considerable extent in that county, and also to meet the demands that a definite name be given it, the name 'Carleton' has been officially applied to it."

Control . See also section on seed treatment at beginning of this summary.

New York.- Long Island: A large percentage of farmers are treating oats for smut. The dry method is used almost entirely.

Virginia: General throughout state, averaging about 4% loss. In experimental tests the following results were obtained:

Treatment	Percent smutted panicles
Check	6.2
Copper-carbonate, 2 oz. per bu.	4.9
Copper-carbonate, 4 oz. per bu.	4.4
Semesan, 1-400, 2 hr. soak	3.4
Nickel-carbonate, 2 oz. per bu.	2.6
Nickel-carbonate, 4 oz. per bu.	1.8
Formaldehyde, 1-320, 2 hr. soak	0.0

(Fromme)

Indiana: Twenty percent of the growers treated the seed. (Gregory)

Illinois: The fields in Franklin and Jackson Counties are splendid examples of what may be secured from a consistent use of treatment. In these counties no loose smut was found in the oats. (Tehon)

Some years ago, seed was generally treated but this practice has gradually died out in the last two years. It will probably be revived when the price of oats rises to the point where growing them will be a profitable industry. (Young)

Michigan: Treatment is almost wholly by dry method. (Coons)

Wisconsin: Seed treatment with formaldehyde satisfactory; method of application not so important as thoroughness of doing the job. (Vaughan)

North Dakota: Seed treatment not so generally practiced as for wheat. (Weniger)

References:

Bartholomew, L. K., and E. S. Jones. Relation of certain soil factors to the infection of oats by loose smut. Jour. Agr. Res. 24: 569-575. May 19, 1923.

Flerov, B. K. Sur la cytologie de Ustilago avenae Pers., d'apres des cultures in vitro. Trav. Sect. Mycol. et Phytopath. Soc. Bot. Russie. 1: 23-36. 1923.

Stem rust caused by Puccinia graminis Pers.

In general the year 1923 was an average year for stem rust. In the principal oats producing region (Iowa, Illinois, and southern Minnesota) the primary infection appeared late and consequently the losses were comparatively small. The highest percentage of loss was 5%. This was reported from both Michigan and North Dakota.

In Minnesota and North Dakota the most severe losses occurred in late fields. There also seemed to be a tendency for the fields farther north to be more heavily infected. In this connection it may be interesting to note that in southeastern Manitoba, according to the Canadian Plant Disease Survey, "Much of the early crop escaped, but in all sections the late crop and in many sections the whole crop was severely injured."

The following losses were reported from state observers:

Table 54. Estimated percentage losses from stem rust of oats, 1923.

State	Percent loss	State	Percent loss
Vermont	1.5	Wisconsin	.5
Massachusetts	2	Minnesota	1
Connecticut	1	Iowa	1
New York	trace	North Dakota	5
Maryland	trace	South Dakota	4
West Virginia	trace	Nebraska	trace
Alabama	trace	Kansas	trace
Texas	1	Colorado	2
Arkansas	2	Arizona	trace
Ohio	.5	Utah	trace
Illinois	trace	Idaho	trace
Michigan	5	Washington	trace

Resistant varieties:

Stakman, Levine, and Bailey report the existence of at least four distinct biologic forms of Puccinia graminis avenae. White Tartar (Minnesota 139) was shown to be resistant to the two forms collected in the United States, moderately resistant to a form collected in South Africa, and susceptible to a form collected in Sweden.

Literature:

Stakman, E. C., M. N. Levine, and D. L. Bailey. Biologic forms of Puccinia graminis on varieties of Avena spp. Jour. Agr. Res. 24: 1013-1018. June 23, 1923.

Crown rust caused by Puccinia coronata Corda

Crown rust was reported from practically all states east of the 100th meridian. The highest percentages of loss were recorded from the extreme southern states but the disease was of considerable importance in Vermont, New York, Indiana, Illinois, Michigan, Iowa, and the Dakotas. North Dakota experienced another epidemic similar to that of 1922.

In Mississippi and Louisiana collaborators reported that plants were frequently killed by rust before seed formation. In states farther north, where buckthorns (Rhamnus spp.) are a factor, it was mentioned that the heaviest losses occurred in the vicinity of buckthorns. Several cases of the spread of rust from buckthorns were reported in a number of states.

Through the cooperation of the men engaged in barberry eradication, and S. M. Dietz, who is working on crown rust, a preliminary survey for the locations of Rhamnus cathartica was made. As a result of that survey Dietz (1) reports that 820 plantings of this shrub consisting of 89,496 bushes, besides 34,018 feet of hedge of uncounted bushes, were found in representative areas in eight mid-western states, (Illinois, Indiana, Iowa, Michigan, Minnesota, North Dakota, South Dakota, and Wisconsin).

Table 55. Estimated percentage loss from crown rust of oats in 1923, according to collaborators.

State	Percentage loss	State	Percentage loss
Vermont	3	Arkansas	15
Massachusetts	2	Ohio	0.5
Connecticut	1	Indiana	2
New York	2	Illinois	2.5
New Jersey	1	Michigan	1
Pennsylvania	1	Wisconsin	0.5
Delaware	0.2	Minnesota	0.1
Maryland	trace	Iowa	1
Virginia	1	North Dakota	5
West Virginia	1	South Dakota	1
Georgia	3	Nebraska	trace
Alabama	3	Kansas	trace
Mississippi	6	Montana	0
Louisiana	20	Colorado	0
Texas	2	Washington	0

Table 56. Dates of earliest observation of crown rust, 1923.

State	On oats		On Rhamnus	
	Date	Location	Date	Location
Florida	January			
Louisiana	January	Baton Rouge		
Mississippi	April 9	Oktibbeha Co.		
South Carolina	April 20	Beaufort		
Illinois	June 4	Jackson Co.		
Delaware	June 7	Seaford		
Nebraska	June 15 (approx.)			
Minnesota	June 26	Waseca Co.	May 22	St. Paul
North Dakota	June 28	Fargo	June 10	Rugby
New York	July 5	Ithaca	May 5	Bronx
Connecticut	July 5	Orange		
Maine			June 5	
Colorado	August	Ft. Collins		

Late maturing varieties and late planted varieties were mentioned as most affected in Arkansas and Wisconsin. Two states, Florida and Louisiana, report on resistant varieties.

Florida: A variety plot of oats was planted on the Experiment Station grounds for the purpose of making selections of the best varieties to be propagated in Florida. When the plants were six weeks old they were attacked by crown rust (Puccinia coronata Cda.), and as the season advanced the disease spread and became worse. About thirty species and varieties were planted. Of this number about eight showed such resistance to the disease that they headed out. The others were either killed or weakened to such an extent that they could not head. Three of the eight varieties that headed showed considerable resistance. Selections were made and the seed will be planted for further selections. (Weber)

Louisiana: A very mild winter allowed an early growth with a very early infection of the rust. The supposedly resistant varieties were injured very badly. (Edgerton)

References:

1. Dietz, S. M. The role of the genus Rhamnus in the dissemination of crown rust. U. S. Dept. Agr. Bul. 1162: 1-18. Sept. 1923.
2. ———————— Epidemiology studies with Puccinia coronata Corda. (Abstract) Phytopath. 14: 41. 1924.

Halo blight caused by Bacterium coronafaciens Elliott

Fifteen states, for the most part in the north-central and northeastern part of the country, but including Idaho and California, reported halo blight in 1923. Judging from the reports it seemed to be most prevalent in southern Minnesota and the eastern Dakotas and Nebraska. It was scattered in its occurrence in Iowa, Wisconsin, and Michigan and was common but not severe in Idaho and California. North Dakota is the only state reporting more than a fraction of a percent loss. In that state 1% loss was estimated and W. Weniger reported that at Fargo it was more severe on early planted (May 2) than on later planted oats (May 17). The following are the dates of first observation, according to collaborators:

May 23	Chisago Co., Minnesota
May 28	Central Iowa
June 4	Lafayette, Indiana
June	Brookings, South Dakota
June 10	Agricultural College, North Dakota
July 1	Madison, Wisconsin
July 2	Hockessin, Delaware
July 13	Batavia, New York

Blast (sterility) non-parasitic

The only states reporting heavy losses from blast were Illinois, where it was serious in some sections and with some varieties, probably causing a reduction in yield for the state as a whole of 5%, and Nebraska, where it was much more common and severe than usual, owing to wet weather at heading time. Kansas and Idaho each reported 2% loss from this cause. In general there seemed to be less of this trouble than usual.

The observation of L. R. Tehon of Illinois that plants from southern seed blasted severely while those from northern seed were not so seriously affected, is of interest.

Other diseases

Anthracnose caused by Colletotrichum cereale Manns - The only states reporting observations of anthracnose are New York (July 31, Horseheads), Alabama, Mississippi (April 30, Washington County), Louisiana (May, Baton Rouge), Texas, and Wisconsin (July 15, Madison). The disease was of very minor importance.

Fusarium blight (scab) caused by Gibberella saubinetii (Mont.) Sacc. - New York, Minnesota, and North Dakota are the only states reporting that this disease was observed on oats in 1923. Only very slight amounts were noted.

Ergot (Claviceps purpurea (Fr.) Tul.) was reported on oats in Whitman County, Washington, according to B. F. Dana.

Leaf blight caused by Helminthosporium sp., probably H. avenae-sativae (B. & C.) Lind. - This was commonly observed on oats in New York, according to Kirby, but did not do any appreciable damage. It was prevalent on winter oats in parts of Delaware and was very serious in test plots in Florida where Weber noted 20% of the seedlings killed in January plantings.

A leaf spot caused by Septoria sp., probably S. avenae Frank, was more common than usual in Illinois, according to L. R. Tehon. It was estimated that it occurred in nearly 90% of the fields in the state and was probably of some importance on account of destruction of leaf tissue.

Leaf spot caused by Scolecotrichum graminis Fckl. was found in New York on one plant in Seneca County, July 9, and in Orleans County, on July 25. (Kirby)

Powdery mildew (Erysiphe graminis DC.) - Reported on oats from New York.

A blade blight and crown rot, apparently caused by a bacterial organism, was reported from Mississippi where it was first collected in Oktibbeha County, April 24.

Bacterium albopr ecipitans Rosen has been successfully inoculated into six oat varieties. (Rosen, H. R. A bacterial disease of foxtail (Chaetochloa lutescens) Ann. Missouri Bot. Gard. 9: 333-402. Nov. 1922).

CORN

Smut caused by Ustilago zeae (Beck.) Ung.

No new facts concerning geographic distribution of corn smut were received in 1923. The disease occurs in all states and probably in almost all sections where corn is grown. It was reported as more prevalent than usual in Connecticut, Delaware, Virginia, Illinois, and Minnesota, but in no state was any outstanding epidemic reported. States reporting less than usual were West Virginia, South Carolina, Georgia, Michigan, and Kansas.

The losses for the country as a whole were probably about normal. The estimated percentage reduction in yield is given in table 57 and revised estimates in bushels will be given in a later publication. In Iowa out of over

57,000 plants that were counted 1.5% showed smut on the ear, and 3.26% showed smut on sterile stalks.

Some of the maximum percentages of infection in individual fields were: 90% Illinois, 50-80% Kansas, 40% Minnesota, 33% Alabama, 25% Colorado and New Mexico, 20% North Dakota, Arkansas, and Virginia.

Table 57. Estimated losses from corn smut, 1923.

Percent loss	States
5	North Dakota
4	Kansas
3	Connecticut, Pennsylvania, Arkansas, Ohio, Illinois, Iowa, New Mexico
2.5	Georgia
2.	New York, Virginia, North Carolina, Alabama, Missouri, South Dakota
1.5	Maryland, Colorado
1.	Vermont, Delaware, West Virginia, South Carolina, Michigan, Utah
0.5	Massachusetts, Indiana, Wisconsin, Minnesota, Kentucky, Tennessee
trace	Mississippi, Louisiana, Texas, Arizona, Idaho, Washington

Sweet corn was mentioned as being affected to a greater extent than field corn in Connecticut, New York, New Jersey, Arkansas, Michigan, Wisconsin, Iowa, and New Mexico. In Iowa about 22% infection was estimated on sweet corn. In Illinois smut was found especially on Democrat, Boone County White, and Reid's Yellow Dent, according to Tehon, and in Michigan, Coons reports it especially severe on Early Cory sweet corn.

Dates of earliest observation of corn smut.

June - Patterson Louisiana
June 21 - Rice Co., Minnesota
June 23 - Adams Co., Illinois
July - Newark, Delaware
July 3 - Hazlet, New Jersey
July - Calhoun, South Carolina
July 14 - Ithaca, New York
August - Brookings, South Dakota
August - Fort Collins, Colorado
August 28- Wahpeton, North Dakota

Rust caused by *Puccinia sorghi* Schw.

This rust was reported to have occurred widely throughout the United States at least as far west as Arizona. Reports from several of the western states are lacking. In no state was it of much economic importance. In general, it was about as prevalent as or somewhat less so than usual but collaborators in the state group composed of South Dakota, Iowa and Kansas estimated more than last year and more than the average. Even in those states, however, the disease was of only minor importance.

Since the time of attack has considerable influence on the amount of damage by rust, the following dates of earliest observation are given:

July	New Castle, Delaware
July 3	Baton Rouge, Louisiana
July 15	Oktibbeha County, Mississippi, Ramsey County, Minnesota
July 30	Ithaca, New York
August	South Dakota, Kansas, Colorado
August 20	McLean County, Illinois

Rust was reported as more common on sweet corn in Illinois and Iowa. The field corn varieties Democrat and Kent were said to be most commonly attacked in Illinois and Minnesota respectively. During the past year. Mains, Trost, and Smith (1) have reported good results in the selecting of resistant individuals from several varieties of both sweet and dent corn.

References:

Cited

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Evans, M. P. Rusts in South Africa II. A sketch of the life cycle of the rust on Mealie and Oxalis. Sci. Bul. Div. Bot. Dept. Agr., South Africa. No. 2, 1923.

Root, stalk and ear rots caused by Gibberella and Fusarium spp.

Root rots were reported as widespread in a large number of states in the eastern half of the country. In some of them they were said to be important locally while in others, such as the Lake States, Iowa, Missouri, and North Carolina, they were thought to be of only slight importance. Root rot is commonly associated with unfavorable soil conditions and so it is often not recognized as a disease and furthermore the losses from it are very difficult to estimate.

Ear rots, other than those caused by Diplodia, are mentioned as very destructive in Florida and Louisiana, where the rainfall was heavy. A thirty acre field at Quincy, Florida, showed 15% to 30% loss. Ear rots resulting from the harvesting of immature corn on account of early frosts, were unusually common in some of the more northern states.

Control of root, stalk and ear rots:

Delaware: Disease free seed corn selected by means of the rag-doll germinating method, showed increases of ten to fourteen bushels in four demonstration tests in Kent County. (Adams)

CORN - Root, stalk and ear rots

Maryland: Progress is being made in the development of resistance through three years of selection. (Temple & Jehle)

Michigan: Seed testing of sweet corn shows great benefit on poorer soils. (Coons)

Kentucky: Some selfed strains have produced a large number of ears which rotted, while others have been entirely free from rotting ears. (Valleau)

References:

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——— Influence of soil temperature and moisture on the development of the seedling blight of wheat and corn caused by Gibberella saubinetii. Jour. Agr. Res. 23: 837-870. Mar. 17, 1923.

Hoffer, G. N. and R. H. Carr. Accumulation of aluminum and iron compounds in corn plants in its probable relation to root rots. Jour. Agr. Res. 23: 801-823. 1923.

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Jehle, R. A., F. W. Oldenburg, and C. E. Temple. Relation of internal cob-discoloration to yield in corn. (Abstract) Phytopath. 14: 46. Jan. 1924.

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Melchers, L. E., and C. O. Johnston. Second progress report on studies of corn seed germination and the prevalence of Fusarium moniliforme and Diplodia zeae. (Abstract) Phytopath. 14: 45. Jan. 1923.

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Valleau, W. D. Studies on seed infection, ear types, and yield, and the isolation of strains of corn showing specific disease reactions in the germinator. (Abstract) Phytopath. 14: 46. Jan. 1924.

——— A method of demonstrating seed infection in supposedly disease-free corn. Science n.s. 58: 186. Sept. 7, 1923.

Dry rot caused by *Diplodia zeae* (Schw.) Lev.

Heavy losses from Diplodia dry rot occurred in Iowa, Missouri, and Kansas, where the disease was apparently more abundant than usual. In the eastern portion of the corn belt conditions did not seem to favor the disease so much, as only a few reports were received. In Iowa it was estimated that about 15% infected seed was planted which injured the stand materially, and later rot of the stalk, shank and ear became prevalent, causing a loss estimated at about 9%. This loss in the leading corn state of the country, where 430,240,000 bushels were produced in 1923, is a very serious one. In Missouri the disease was by far the most destructive of any of the ear rots and in Kansas it was more injurious than ever before. Dry rot is rapidly coming to be recognized as one of the most serious of the corn diseases.

References:

Durrell, Lawrence. Dry rot of corn. Iowa Agr. Exp. Sta. Res. Bul. 77: 347-376. July 1923.

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Melchers, L. E., and C. O. Johnston. Second progress report on studies of corn seed germination and the prevalence of Fusarium moniliforme and Diplodia zeae. (Abstract) Phytopath. 14: 45. Jan. 1924.

Brown spot caused by Physoderma zeae-maydis Shaw

Brown spot was reported in the South Atlantic and Gulf Coast States from North Carolina to Louisiana, and also in Arkansas, Ohio, Indiana, and in Illinois, which was the only state reporting more than usual. In that state it was very prevalent and, according to L. R. Tehon, was observed in ten widely scattered counties. It was found as far north as Carroll County in the northern part of the state. One hundred percent infection was observed in some fields. Collaborators in each of the Gulf States mention attack of the stalk near the ground with subsequent breaking over.

Dates of earliest observation, 1923.

June	New Orleans, Louisiana
June 20	Oktibbeha County, Mississippi
July 20	Monroe County, Illinois
July 27	Seneca, South Carolina
August 5	Battleground, Indiana

The dent varieties - Boone County White, Yellow Dent, Reid's Yellow Dent, and Democrat were mentioned as susceptible in Illinois, and in Indiana the only observation that was made was on Early Yellow Dent.

Bacterial wilt caused by Aplanobacter stewartii(EFS.) McCul.

Massachusetts, New York, Maryland, Virginia, Ohio, Indiana, Illinois, Missouri, and Kansas reported this disease on sweet corn. As high as 15% infection was observed in Maryland, and in Illinois, Tehon reported 5 to 30% infection in three small fields in Adams County and from 60% to 90% rotten stalks in a three-acre field in Union County. The disease was considered worse than usual in Ohio, Indiana, and Illinois. Most of the reports were on sweet corn but it was common on dent field corn in Illinois, and in New York a field of pop corn was severely infected. Golden Bantam was the sweet corn variety most commonly reported diseased. In a recent article, Rand (1) has given a list of varieties in order of their susceptibility, according to trials in 1919 and 1920.

Reference:

1. Rand, F. V. Bacterial wilt or Stewart's disease of corn. The Canner. 56^{10}: 164-165. Mar. 1923.

Mosaic, cause undetermined

C. W. Edgerton, of Louisiana, reports corn mosaic as follows:

> "Very common with often high percentages of infection in the sugar cane belt. Reduces the yield to some extent, but evidently does not do the damage that is reported for tropical countries. Yellows the leaves and stunts the plants. It occurs in the southern part of the state."

Leaf blight caused by Helminthosporium turcicum Pass.

Connecticut, Delaware, West Virginia, Florida, Mississippi, and Missouri reported this disease. It was much less prevalent in the first two states than in 1922, when it was epidemic. As a whole the disease was of very slight importance.

Bacterial stalk rot caused by Bacterium dissolvens Rosen

A slight amount of this disease was noted this year in Arkansas counties bordering the Mississippi River, according to H. R. Rosen. Two infected plants were also found in Alexander County, Illinois, on July 28. This is a new locality for Illinois.

Black bundle caused by Cephalosporium acremonium Corda.

Reddy and Holbert (1) have recently reported this disease of corn for the first time. They believe it to be an important cause of reduction in corn yields through promoting excessive suckering, barrenness, nubbin production and the like. The disease has been noted in Connecticut, New York, Ohio, Indiana, Illinois, Wisconsin, Minnesota, Iowa, South Dakota, Kansas, South Carolina, and California, and the authors make the statement that it probably occurs wherever corn is grown in the United States.

L. R. Tehon reports that black bundle was apparently quite important in Illinois last year. In Clark County one field showed 3% of the stand affected.

A disease associated with Hyalopus sp. which is probably the same as black bundle was observed in New York as very common on Long Island from 1920 to 1922, and in 1923 it was observed for the first time in Orange County, New York, according to R. S. Kirby.

Manns and Adams (Science n.s. 54: 385-387, 1921) have called attention to the parasitism of Cephalosporium as an ear mold but Reddy and Holbert are the first to recognize it as a disease of the corn plant.

Other diseases

Basisporium gallarum (*Coniosporium* sp.) causing a cob rot of field corn, was very important in Iowa, according to Melhus. It became general during the latter part of September, rotting the shank and base of the ear. According to G. P. Clinton and F. A. McCormick it appears to be parasitic on matured ears of corn in Connecticut also.

Head smut caused by *Sorosporium reilianum* (Kühn) McAlp. continued present in considerable amounts in field and garden corn in the vicinity of Pullman, Washington, according to B. F. Dana.

Sclerotium rolfsii Sacc. was common on corn in Florida, according to G. F. Weber.

Macrosporium sp. was recorded as causing a conspicuous spotting on the leaves locally in Florida.

Leaf blight of sweet corn, cause unknown, but reported in previous summaries from this office as probably due to bacteria, was noted by Hungerford in several gardens at Moscow, Idaho, where it was blighting the leaves and even killing some of the plants. Diseases of a similar nature were reported from Wisconsin and Florida in 1923.

Reference:

1. Reddy, Charles S., and James R. Holbert. The black bundle disease of corn. Jour. Agr. Res. 37: 177-205. Jan. 26, 1924.

RICE

Straighthead (non-parasitic) was reported from Louisiana (of considerable importance, about the same as usual), Texas (prevalent, loss 3%), and Arkansas (common, varieties Honduras, Storm Proof and Prolific seem most susceptible and Jap and Blue Rose less so).

Blast caused by *Piricularia oryzae* Br. & Cav. Louisiana (not very important), Texas (trace), and Arkansas (quite common and serious in isolated localities).

Sesame spot caused by *Helminthosporium oryzae* De H. was collected at Gainesville, Florida, where 100% infection occurred in one small patch.

References:

1. Nishikado, Yoshikazu. Effect of temperature on the growth of Helminthosporium oryzae Br. D. Haan. Ann. Phytopath. Soc. Japan 1: 20-30. 1923. In Japanese, English summary: p.29-30.
2. Willis, L. G. and J. O. Carrero. Influence of some nitrogenous fertilizers on the development of chlorosis in rice. Jour. Agr. Res. 24: 621-640. May 19, 1923.

FLAX

Rust caused by Melampsora lini (Pers.) Desm.

The facts received regarding rust are contained in the following reports: Wisconsin - Same as usual, minor. (Vaughan). Minnesota - Generally prevalent, less abundant on uplands than on low soils, especially peat, developed rather late. (Sect. Plant Path.) North Dakota - More prevalent than last year or the average year and of considerable importance, probably causing a loss of 1% in the state. It occurred in the Red River Valley and as far west as Mandan. (W. E. Brentzel). South Dakota - Of slight importance, occurring only in eastern South Dakota. (Evans)

The dates of earliest observations were -

June 28	Winthrop, Minnesota
July 5	Fargo, North Dakota
July	Aberdeen, South Dakota
July 30	Madison, Wisconsin

Wilt caused by Fusarium lini Bolley

The following losses from wilt were reported: Minnesota 5%, North Dakota 10-15%, South Dakota 2 to 3%. Iowa and Wisconsin also reported slight amounts of the disease, but no estimates of loss were given.

The situation regarding this disease is well outlined in the two statements below by W. E. Brentzel, located in North Dakota, and A. C. Dillman, agronomist in charge of flax investigations in the Bureau of Plant Industry.

> "Due to warm dry weather in the first two weeks of June, wilt was more severe than in average years. The flax acreage was greatly increased this year. The demand for resistant seed exceeded the supply. Susceptible seed was sown on many wilt-infested fields. The loss ranged from a trace to 100% of the crop." (W. E. Brentzel)

> "Genuine wilt-resistant flaxseed is in great demand, because flax is being grown more extensively on old lands. Considerable losses from wilt occurred in parts of Minnesota, eastern South Dakota, and eastern North Dakota because farmers were unable to obtain wilt-resistant flax and took a chance in seeding common flax.
>
> "New varieties of wilt-resistant flax which give very great promise are Winona and Chippewa, developed at the Minnesota Agricultural Experiment Station, and now being increased for distribution. At the Northwest Experiment Station, Crookston, Minnesota, 24 acres of the Chippewa flax were grown this year, with prospects of a very large crop of seed. N. D. No. 40013, C.I. No. 241, is a new wilt-resistant variety selected by T. E. Stoa, of the North Dakota Agricultural Experiment Station. This variety produced the highest yield in the varietal plats at Mandan, this year. Slope, C. I. No. 274, a new variety developed at Mandan, is very similar to C. I. No. 241. A selection of Argentine flax developed by H. D. Long, of the North Dakota Agricultural Experiment Station, is also very promising." (A. C. Dillman in Cereal Courier, 15: 247, Sept. 20, 1923)

"Pasmo" caused by *Phlyctaena linicola* Speg.

During the year this recently reported (1) disease of flax was found in three new states, - Wisconsin, Minnesota, and South Dakota (2).

Michigan: Twice as prevalent as last year causing a marked reduction in seed yield and spoiling fiber. At present it is localized at East Lansing where it was noted this year about August 1. The chief danger from this disease lies in its possible spread to other sections. (R. Davis)

Minnesota: Specimens have been received from Watonwan, Hennepin, and Ramsey Counties, Minnesota. The disease probably occurs elsewhere but so far it has not been reported to my knowledge. It apparently has done considerable damage in Watonwan County, as it was noticed by the county agent there and sent in for determination. The disease is rather destructive in small plots in Hennepin County but somewhat less prevalent at University Farm. (A. W. Henry)

North Dakota: The Pasmo disease of flax was common in the eastern half of the state this year. It has not been reported from the western part as yet. Certain varieties showed marked susceptibility to the disease this year, particularly those having a relation to Argentine flax. In the Red River Valley infection ranged from a trace to 100%, based on number of plants found infected. (W. E. Brentzel)

South Dakota: On the Belle Fourche Experiment Farm, Newell, S. Dak., Mr. (Arthur C.) Dillman discovered an infection of the pasmo disease of flax which recently has been described by W. E. Brentzel, assistant pathologist. This was found in a late sown plat of N. D. R. No. 114 flax, being quite generally distributed throughout the plat of about one-eighth acre. It was estimated that about 7% of the plants were affected. (Cereal Courier 15: 247. Sept. 20, 1923)

References:

1. Brentzel, W. E. A disease of flax not previously reported in the United States. (Abstract) Phytopath. 13: 53-54. Jan. 1923.

2. ——— Further investigations on the pasmo disease of flax. (Abstract) Phytopath. 14: 48-49. Jan. 1924.

Heat canker (Non-parasitic)

Heat canker was more destructive than usual, especially on early sown flax, in Minnesota and North Dakota, due to an early, hot period that occurred on June 2 and 3. As high as 13% of cankered plants was noted in trial plots in Hennepin County, Minnesota, while 75% was observed in North Dakota and an estimated loss to the state of 5% was reported by W. E. Brentzel.

BUCKWHEAT

Ramularia rufo-maculans Pk. was collected by E. B. Mains for the first time in Indiana. Specimens are on file from Michigan and a report from Connecticut is on record.

Ascochyta fagopyri Bres. was collected and determined by E. E. Honey, Nov. 3, in Tompkins County, New York. This is the first report to the Survey from New York.

SORGHUM

Covered kernel smut caused by Sphacelotheca sorghi (Link) Clinton.

Connecticut, Mississippi, Minnesota, North Dakota, Kansas, Texas, New Mexico, Colorado, and Washington reported this smut in 1923. In Minnesota it was observed only on varieties introduced from Kansas. More smut than usual occurred in Kansas, where 4% loss to grain sorghum was estimated, and a maximum of 80% infection was observed in individual fields. In the state of Washington a maximum of 30% was noted in a field of broom corn, and in North Dakota and Minnesota as high as 30% and 37%, respectively, were observed. Average losses of 1% were estimated for the states of Texas and North Dakota.

That sorghum varieties differ markedly in their susceptibility to this smut is shown by the results of a test made in Kansas in 1922. (Melchers, L. E., and C. O. Johnston. Sorghum smut investigations. Cereal Courier 15: 28-29. Feb. 28, 1923.)

Table 58. Data on varietal experiment with sorghums to determine resistance to kernel smut, Kansas Agricultural Experiment Station, 1922.

	Variety	Percent smut
1	Blackhull kafir	38.1
2	Spur feterita	0
3	Red Amber sorgo	23.9
4	Dwarf Hegari	0
5	Black Amber sorgo	8.0
6	Standard White milo	0
7	Shrock sorghum	35.7
8	Feterita (C. I. No. 782)	0
9	Dawn kafir	60.0
10	Husserita	33.3

For results on control see section on seed treatment.

References:

1. Johnston, C. O. and L. E. Melchers. Fungicidal treatments for the control of sorghum kernel smut. (Abstract) Phytopath. 14: 44. Jan. 1924.
2. Reed, G. M. Varietal resistance and susceptibility of sorghums to Sphacelotheca sorghi (Link) Clinton and Sphacelotheca cruenta (Kühn) Potter. Mycologia 15: 132-143. May 1923.

Head smut caused by Sorosporium reilianum (Kühn) McAlp. Texas (trace); Minnesota (Occurred chiefly in the neighborhood of Waconia, the center of the sorghum industry of the state; serious in some fields, marked variation in susceptibility occurred in selfed lines); Kansas (Only report received was from Colby, where it occurred on yellow milo; the first report on this variety in America); New Mexico (Slight, not common).

Loose kernel smut caused by Sphacelotheca cruenta (Kühn) Potter

Texas and Oklahoma are the only states reporting this smut. See reference (Reed, 2) on varietal susceptibility under covered kernel smut above.

Bacterial blight caused by Bacillus sorghi Burr.

Bacterial blight was reported from Illinois, Wisconsin, and Iowa. From Illinois, L. R. Tehon reported:

> "Found in practically all fields visited (in the broom corn region of Douglas County) where there was 100% infestation upon plants, the disease varying from merely a trace up to a maximum of spotting and rarely entire plants were so thoroughly infested as to be badly stunted and rotted throughout the entire interior. In one field not less than one in every 500 plants was that badly affected."

Other diseases

Anthracnose caused by Colletotrichum sp. occurred in Illinois in the broom corn section of Douglas County, where it and bacterial blight (Bacillus sorghi) constituted the two most serious diseases. Mississippi also reported the disease.

Leafspot caused by Cercospora sp. occurred in Mississippi and Florida. From the latter state G. F. Weber reported:

> "Cercospora longipes Butler caused considerable loss of leaf area in a field (of sorghum) near Gainesville. The leaves were three-fourths killed soon after blossoming time.
>
> "It caused almost a total destruction of leaves on Kaffir corn in a field near Gainesville. All leaves were completely killed soon after blossoming time."

Rust caused by Puccinia purpurea Cooke. Traces of this rust were found in Florida and Mississippi. In no instance was it of any particular importance.

A bacterial disease of broom corn and sorghum, caused by Bacterium andropogoni EFS., has just been described by Charlotte Elliott and E. F. Smith. (1).

Bacterium albopreciptans has been used to artificially infect Holcus sorghum and H. sorghum sudanensis according to Rosen (2).

SORGHUM - Other diseases

A stalk rot of undetermined cause has been noticed for a number of seasons by Melchers in Kansas. It is not common, but has occurred frequently in certain pure lines of sorghum.

A kernel rot associated with Fusarium was noted affecting 100% of the kernels in heads of almost mature plants in Florida, according to G. F. Weber.

References:

1. Elliott, Charlotte, and Erwin F. Smith. A bacterial disease of broomcorn and sorghum. (Abstract) Phytopath. 14: 48. Jan. 1924.
2. Rosen, H. R. A bacterial disease of foxtail (Chaetochloa lutescens). Ann. Missouri Bot. Gard. 9: 333-402. Nov. 1922.

DISEASES OF FORAGE CROPS

A. LEGUMES

ALFALFA

Leafspot caused by Pseudopeziza medicaginis (Lib.) Sacc.

The majority of the states reported this common alfalfa disease, indicating that it was widely distributed, as usual, with the crop. The only states reporting more than normal prevalence are Delaware, Illinois and Indiana. In the two last it was especially serious on the second cutting. In general the disease was considered of only slight importance, but in Iowa 10%, and in Illinois and New Mexico 5% loss was estimated.

Yellow leaf blotch caused by Pyrenopeziza medicaginis Fckl.

Reports of this disease were received from widely scattered states, from New York in the east to Washington in the northwest. One percent loss to the first cutting was reported in New York and 2% was estimated for Kansas and Idaho, where it occurred with more than the usual severity. Collaborators in Iowa also reported it important and more abundant than last year.

Root rot caused by Sclerotinia trifoliorum Erikss.

Virginia (severe locally), Kentucky (about the same, slight), and Oregon reported this root rot. It was also collected in Orange County, New York on October 12. This is the first record this office has of the occurrence of this disease in New York. From Oregon, H. A. Schoth reported:

> "At present the alfalfa growers in southern Oregon, in the Grants Pass district, are having some trouble with this

> disease. Last year it did considerable damage in a few places while this year the damage was very slight."

Eel worm disease caused by Tylenchus dipsaci (Kühn) Bastian.

In 1922 this nematode was known to occur only in three or four fields at Hermiston, Oregon. In 1923, however, surveys conducted under the leadership of G. H. Godfrey showed the nematode to be much more widely distributed in the northern part of Umatilla County, Oregon than was realized. The indications were that it had been present in that region for several years.

In the Yakima Valley in Washington it was found all the way from Yakima to Kenewick, some fields being severely infested, others only slightly so and still others entirely free. Fields around Pasco, which is across the Columbia River from Kenewick were free from the disease.

A considerable number of alfalfa fields in the Walla Walla district Washington, in the vicinity of Pendleton and La Grande, Oregon, and in southern Idaho were examined and found to be free from infestation.

In California the disease was discovered on six or eight different farms near Watsonville within three miles of a field from which it was first reported in April 1923. An attempt is being made to eradicate it in that section.

A careful survey made in the Yuma and Salt River projects in Arizona and around Bard, Riverside, and Sacramento failed to disclose any of the eelworm disease.

From Colorado, collaborator G. D. Learn reported infestations in two localities, reports being accompanied by specimens. The first occurrence was noted June 7 in Canon City, Fremont County and the second later in the season in Walsenburg, Huerfano County. Regarding these occurrences Learn writes as follows:

> "The plot at Canon City consists of about 1-1/2 acres on a ridge with ditch on two sides with waste water running into the valley. There is a suspicious plot about a mile distant and it is not at all improbable that it is scattered down the valley for some distance. This can only be determined by a careful survey. The extent of the area at Walsenburg has not been determined."

Literature:

Godfrey, G. H. Watch for alfalfa eelworm. Oregon Farmer 36^{16}: 6-7. April 19, 1923. Washington Farmer 48^{21}: 10. May 24, 1923.

———— The alfalfa stem nematode (Tylenchus dipsaci). California Dept. Agr. Mo. Bul. 12: 299-303. June 1923.

———— The eelworm disease; a menace to alfalfa in America. U. S. Dept. Agr. Cir. 297: 1-8. Oct. 1923.

———— Present status of stem and bulb nematode in America. (Abstract) Phytopath. 14: 62. Jan. 1924.

Smith, E. H. The stem nematode of alfalfa in California. California Dept. Agr. Mo. Bul. 12: 136-138. March-April 1923.

Rust caused by Uromyces striatus Schroet. = (U. medicaginis Pass).

The majority of the southern states including Arizona and California reported this rust. In Indiana, Wisconsin, Missouri, and Kansas it was also recorded.

Root rot caused by Ozonium omnivorum Shear

Serious as usual, especially in irrigated fields in the Rio Grande Valley, Texas. An estimate of 5% loss is made for the state. It was also of importance in Arizona, where it was reported from all counties, excepting Navajo, Apache, and Coconino. A loss of 1,000 acres was estimated for Yuma County and 15% of the crop for Yavapai County.

Reference:

King, C. J. Cotton root rot in Arizona. Jour. Agr. Res. 23: 525-527. Feb. 1923.

Anthracnose caused by Colletotrichum trifolii Bain

Missouri: General and severe around Charleston, according to I. T. Scott and W. E. Maneval.

Mississippi: Very serious, probably causing a loss of about 3% in the state. Especially destructive in the delta region where most alfalfa is grown. Some large fields abandoned on account of this disease. First appearance April 10. (Neal and Barker)

Bacterial blight caused by Bacterium medicaginis (Sackett) EFS.

Slight amounts were reported from Colorado, Arizona, Idaho, and Washington. From Arizona, J. G. Brown writes that it was observed only at the higher altitudes in Yavapai County, where it first appeared early in April.

Downy mildew caused by Peronospora trifoliorum de Bary

Was reported from a considerable number of widely scattered states, both eastern and western. New York, Michigan, and Iowa report about as much as any state. Collaborators in Iowa, Kansas, and Arizona made especial note of its occurrence in newly planted fields.

Other diseases

Leafspot (Cercospora medicaginis E. & E) - Texas (traces).

Crown wart caused by Urophlyctis alfalfae (Lag.) Magn. Quite generally distributed throughout California. (Milbrath)

ALFALFA - Other diseases

Violet root rot caused by Rhizoctonia medicaginis (DC.) Tul. Plants affected with this disease were collected in October from a single field near Paw Paw, Michigan, where it was causing a severe killing of alfalfa. This is the first report from Michigan. The only other state reporting this root rot was Kansas, where it was quite common especially in the older alfalfa fields.

Dodder (Cuscuta spp.) Reported from New York, Texas, New Mexico and Washington.

Root rot associated with species of Fusarium. Reported from -

Illinois: More than average, loss slight but serious where it occurred in the northwestern part of the state. (Tehon)

Missouri: Occurred on several farms in Scott County. (Maneval)

Idaho: A few infected plants in many fields. (Hungerford)

Washington: What appears to be a definite root rot due to a species of Fusarium was first reported from Starbuck, May 10, and has since been found near Benton City. (Dana)

Root rots of uncertain cause were reported from Kentucky, Indiana, and South Dakota. W. D. Valleau reports the following from Kentucky.

> "Difficulty has been reported in securing stands of alfalfa following alfalfa. One field under observation which followed a previous crop has never done well, although the first crop was good. It yellows badly, while alfalfa planted for the first time a few feet away remains green. The roots show numerous rot lesions."

Mosaic of alfalfa was found in small amounts in Genesse, Herkimer, Livingston and Schoharie Counties, New York. It was first found June 15 at Central Bridge. (R. S. Kirby)

White spot (undet.) was reported from the Upper Peninsula of Michigan, June 15. This is the first report from Michigan.

Slime mold (Physarum sp.) was reported by R. P. White of Kansas to be very important during June in some fields in Riley County Kansas. It smothered out the plants in spots, being favored by a very wet spring.

General reference:

Scott, C. E. Diseases of alfalfa in California. Mo. Bul. California State Dept. Agr. 12: 151-152. 1923.

RED CLOVER

Anthracnose caused by Colletotrichum trifolii Bain and Gloeosporium caulivorum Kirch.

The diseases caused by these two fungi are not usually separated by collaborators and so they are reported under the same heading in this summary. The majority of reports concerned the Colletotrichum, however. In 1923 anthracnose was reported to the Survey from Pennsylvania (present in most fields), Delaware (leaf spot generally observed on first growth), Virginia (severe injury wherever seen, probably causes more loss than all other clover diseases combined), Louisiana (trace seen), Texas (trace), Indiana (same as usual, of little importance), Michigan (more severe than last year), Iowa (less than usual).

References:

1. Monteith, John Jr. Relative susceptibility of red clover to anthracnose and mildew. (Abstract) Phytopath. 14: 62-63. Jan. 1923.
   Plants from seed grown in Italy or other countries in Southern Europe are very susceptible to anthracnose, while many, although not all, of the American clovers are somewhat resistant.
2. Ware, W. M. "Scorch" or Gloeosporium disease of red clover. Jour. Min. Agr. Great Britain 30: 833-836. Dec. 1923.
   In six small trial plots an English broad red clover was strongly attacked, Chilian and English "cow-grass" red clover and English late-flowering red were attacked to a less extent, "perennialised broad red" was only slightly attacked, and "Hersnap"(a Danish strain) showed only a very few lesions with no broken stems.

Powdery mildew caused by _Erysiphe_ sp.

Powdery mildew of red clover was delayed in its appearance this year and so the first crop largely escaped heavy infection in most states. Commencing with the second crop, however, the disease became very conspicuous and before the season closed it had been reported widespread in practically all of the eastern states as far west as the Dakotas, Colorado, Arkansas, and Louisiana. It was also reported from all of the Canadian Provinces east of Saskatchewan (Canadian Plant Disease Survey). Practically all of the reports are in agreement that in general the mildew was less severe than last year (1922) although in northern New England observations pointed toward equal severity.

From Washington and Idaho reports were received of the powdery mildew of clover (_Erysiphe polygoni_ DC.) that has been observed frequently in that part of the country before. This form produces perithecia freely while the more recently observed eastern form does not. The Washington and Idaho reports also indicate that it was more common on alsike than on red clover while in the case of the eastern form the reverse is true.

The following are some typical state reports.

Maine: As far as I have observed powdery mildew on red clover again appears to be almost universal in southern Maine. Some fields where the second crop has grown up after haying are simply white with it. I have not had opportunity to make observations in northern Maine but since alsike clover is grown there considerably more than red clover it is probable that they are having less trouble. (Morse)

New Hampshire: We had a very dry summer and fungous diseases have been less prevalent than usual. The powdery mildew of clover, however, was just as conspicuous and widespread as usual. (Butler)

RED CLOVER - Powdery mildew

Vermont: Very abundant this season as it has been for the past two or three years. (Gilbert and Lutman)

Massachusetts: Reported throughout the state and more severe even than in 1922. Apparently it appeared somewhat earlier than last year. Found only on Trifolium pratense and apparently not transferable to T. incarnatum, T. medium or T. repens. (Osmun)

New York: This pathogene appeared in the lower Hudson Valley about June 14 to 15 and in the central and western part of the state June 16 to 20. It occurred wherever red clover is grown. (Kirby)

Pennsylvania: General but much less than the three previous years. (Thurston)

Delaware: Slightly prevalent with early growth in June. After first cutting very little evidence of disease found. Drouth conditions seriously affected hay crop and pastures. In August, the disease again became prevalent. (Adams)

Virginia: Less. Considerable complaint. Came later than last year. (Fromme)

Kentucky: Fergus reports that on November 13, 1922, 5% of leaves were infected. On November 29, 1922 practically none. All through the winter none could be found. On June 26, 1923 it was just beginning to appear and slowly developed through the summer. (Valleau)

Alabama: Little. Observed occasionally on volunteer plants of red clover. (Miles)

Louisiana: About same. Of some importance. (Edgerton)

Ohio: Quite generally distributed but apparently causes little injury. (Young)

Indiana: Statewide with crop, worse in southern Indiana. Conspicuous in Knox County July 24. Appeared after the first cutting. (Mains and Gardner)

Wisconsin: Less than last year. More than average year. Minor importance. Came late on second crop only. (Vaughan)

Minnesota: Less than last year. More than for average year. Of no importance until late in season. (Sect. Plant Path.)

Missouri: Survey from Kansas City to St. Louis, shows that the plague is all over the rich bottoms and hills bordering the Missouri River and reports come in from the rest of the state as general. It is not perhaps generally as white as last year but it is on quite as many leaves. (Burrill)

South Dakota: All red clover heavily infected. Seems to do no damage. (Evans)

Kansas: About the same as last year, of minor importance, appeared very late and occurred all over the state. (Melchers)

Colorado: Noted for the first time in the state in two localities only on medium red clover. (Learn)

Dates of earliest observation, 1923.

April	Baton Rouge, La.	June 16	Sunderland, Mass.
May 1	Panola Co., Miss.	June 20	Seaford, Del.
May	Columbia, Mo.	June 26	Kentucky.
May 22	Edwardsville, Ill.	July	Brookings, S. D.
May 29	Knoxville, Tenn.	July 1	Fargo, N. D.
May 30	Clemson College, S.C.	July 11	Orange, Conn.
June (early)	North Carolina	July 14	Cass Co., Minn.
June 5	Bedford, Va.	July 15	Wisconsin.
June 16	Columbia Co., N. Y.	July 15	East Kingston, N. H.

Collaborators in Pennsylvania, Indiana, and Louisiana all confirm the observations previously reported that American strains of red clover are more susceptible than those from Europe and South America.

References:

Mains, E. B. Differences in the susceptibility of clover to powdery mildew. Proc. Indiana Acad. Science. 38: 307-313. 1923.

Monteith, John Jr. Relative susceptibility of red clover to anthracnose and mildew. (Abstract) Phytopath. 14: 62-63. Jan. 1924.

U. S. Dept. Agr. Plant Disease Reporter 7: 17, 26, 40-41, 55-56. 1923.

Rusts caused by *Uromyces* spp.

In a recent abstract (1) W. H. Davis has reported three different rusts on our common clovers. The rust on white clover (*Trifolium repens*) he considers to be *Uromyces trifolii-repentis* (Cast.) Liro. The rust on red clover (*T. pratense*) and on mammoth clover (*T. medium*) is *Uromyces trifolii* (Hedw.) Lév. and that on alsike clover (*T. hybridum*) he calls *Uromyces hybridi* Davis.

For the most part the reports that came in to the Plant Disease Survey did not specify the kind of clover on which rust was occurring. Twenty-three states reported the disease on clover but only five mentioned the kind of clover as follows: Connecticut, New York, Alabama, and Georgia specifically mentioned red clover as being rusted; Connecticut and New York reported rust on white clover; and these two states as well as Massachusetts and Washington reported alsike as being affected.

The following are the dates of first observation of the rust in 1923 according to collaborators:

Red clover - June 14, Otsego County, New York.
June 25, Ramsey County, Minnesota

White clover - July 11, Millford, Connecticut
May 5 - New York

Alsike clover - June 7, Highwood, Connecticut
June 11, Le Roy, New York

Table 59. Taxonomy of clover rusts.

Kind of Clover (Trifolium)	Species of Uromyces according to	
	Davis (1) (Uromyces)	Arthur (2) (Nigredo)
T. pratense - red	U. trifolii (Hedw. f) Lév.	N. fallens (Desm.) Arth.
T. repens - white	U. trifolii-repentis (Cast.) Liro	N. trifolii (Hedw. f) Arth.
T. hybridum - alsike	U. hybridi Davis	N. trifolii (Hedw. f) Arth.
T. medium - mammoth	U. trifolii (Hedw. f.) Lév.	N. fallens (Desm.) Arth.
T. incarnatum - crimson		N. fallens (Desm.) Arth. N. trifolii (Hedw. f) Arth.

References:

1. Davis, W. H. Summary of investigations on clover rusts. (Abstract) Phytopath. 14: 33. Jan. 1924.
2. Arthur, J. C. Aecidiaceae. Uredinales. N. Am. Fl. 7^3: 254-255. 1912.

Mosaic, cause undetermined

Four states reported clover mosaic. It is probable that the disease reported is a true mosaic although the reports do not indicate that successful infection tests were conducted. Mosaic on red clover was reported from New York (May 15), Indiana (widespread), and Louisiana (May 4 at Baton Rouge, first report in state). On crimson clover Connecticut and Indiana reported mosaic. In the latter state a plot of 47 varieties and eleven species showed some mosaic on crimson clover only. Mosaic on white and alsike clovers is also reported from New York.

Root rot caused by Sclerotinia trifoliorum Erikss.

In addition to reports from the Middle Atlantic and Ohio Valley states where this root rot is commonly found, information was received for the first time of its occurrence in New York and Idaho. In New York it was observed in three counties in the Hudson Valley, being first seen June 16 at Volatie, Columbia County. In Idaho it occurred at Dudley in red clover fields along the Coeur d' Alene River where it was rather severe locally. A report is at hand from Ingham County, Michigan and the following statement by H. A. Schoth, Assistant Agronomist of the Oregon Agricultural Experiment Station showing the situation in the Willamette Valley has been contributed through A. J. Pieters of the Department of Agriculture.

> "The Sclerotinia that is prevalent and which is doing considerable damage to legumes in the Willamette Valley is Sclerotinia trifoliorum. It attacks alsike, red, white, crimson, sweet, and Ladino clover, alfalfa, lupines, vetches, and field peas.
>
> "The distribution and heaviness of its attack varies with the condition of the crop and the climatic peculiarities, and apparently to some extent on soil conditions.
>
> "The period of attack is usually during early spring, March and April, and extending into July. The length of period of attack depends largely upon the climatic conditions, although plant conditions have a noticeable influence at times.
>
> "The most damage is usually done after a mild winter during which the plants have made a heavy growth and a dense covering over the ground. This condition, which results in rather poor air circulation and holding of moisture at the surface, together with warm moist weather, is ideal for rapid spread of the disease.
>
> "Plants on land that is low and holds the moisture until warm weather sets in are often attacked worse than those growing on higher, better drained land.
>
> "The extent of the attacks varies considerably during different years. In 1921 I had occasion to examine several fields of clover and vetch attacked by this disease. One 40-acre field of alsike clover was practically destroyed and the sclerotia covered the ground in such quantities that they could be scraped together and gathered by the handful. I also saw severe attacks on red clover and common and purple vetch. Sweet clover here at the station and another planting three miles from here were almost completely destroyed. Fields of red and alsike clover near the attacked ones were almost free from the disease, showing that it is not everywhere to the same extent at the same time. During 1922 and 1923 there has been comparatively little trouble from the disease. Whether this is due to the comparatively small acreage, to crop rotation methods, or to unfavorable climatic conditions at some certain period, I do not know."

Other diseases

Root rots associated with Fusaria were reported from Ohio, Indiana, and Idaho. A very striking and significant illustration of the effect of sterilized and unsterilized soil on the growth of clover in Kentucky has been given in Plant Disease Reporter 7: 105-106. Nov. 1, 1923.

RED CLOVER - Other diseases

Nematode - Tylenchus dipsaci (Kühn) Bastian. This nematode was common and very important in old clover fields in Twin Falls and Canyon Counties Idaho according to C. W. Hungerford.

Sooty spot caused by Phyllachora trifolii (Pers.) Fckl. =(Polythrincium trifolii Kunze). On white clover this disease was reported from Connecticut, New York, Alabama, Louisiana, Indiana, and Kansas. It was also reported from New York on alsike and red clover and from Alabama on Trifolium reflexum.

The disease ruined at least one lawn at Manhattan, Kansas, but that is the only report of any particular damage.

Killian (3) states that the ascigerous stage of the fungus should be classified under the genus Plowrightia instead of Phyllachora.

Bacterial leafspot - Jones, Williamson, Wolf, and McCulloch (2) have described a leafspot disease of Trifolium spp. as due to Bacterium trifoliorum n. sp. Observations in various parts of Wisconsin, Iowa, Indiana, North Carolina, Virginia, Maryland, and in the District of Columbia indicate that the disease probably occurs widely in the United States, but has previously escaped notice through confusion with other leafspots of clover. The authors state that "The type strain from Wisconsin has proved pathogenic only on the red clovers (Trifolium pratense L. and T. medium L.); the strains from North Carolina and the vicinity of Washington, D. C., otherwise scarcely distinguishable, have been proved pathogenic also on T. repens L., T. hybridum L., T. incarnatum L., T. pannonicum L., and T. alexandrinum L. Lesions occur on leaves, stems, petioles, stipules, and flowers."

Leafspot caused by Sphaerulina trifolii E. Rostr. was reported by Hopkins (1) as having been observed at various points in Missouri, at Ithaca, New York, and Godfrey, Illinois, most commonly on white clover (T. repens). It has been found also on alsike clover (T. hybridum) and on red clover (T. pratense), and inoculation experiments indicate that mammoth clover (T. pratense perenne) is susceptible. Hopkins states that this is apparently the first report of the occurrence of this disease in America.

Leafspot caused by Pseudopeziza trifolii (Bernh.) Fckl. Slight amounts of this disease were reported from a few states, chiefly in the northeastern part of the country. In New York it was collected on alsike and white as well as on red clover. No especial damage was recorded.

Leafspot caused by Macrosporium sarcinaeforme Cav. - reported from Connecticut and Kentucky on red clover.

Cercospora sp. on alsike clover - reported from Indiana.

Dodder (Cuscuta sp.) - "A field of 10 acres in Washington County, Illinois, showed between 20% and 30% of the plants parasitized. This was just at the time the first crop was being cut." (Tehon)

General references:

1. Hopkins, E. F. The Sphaerulina leafspot of clover. Phytopath. 13: 117-126. Mar. 1923.
2. Jones, L. R., M. M. Williamson, F. A. Wolf, and Lucia McCulloch. Bacterial leafspot of clovers. Jour. Agr. Res. 25: 471-490. Sept. 1923.
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4. Marchionatto, J. B. Sobre la presencia de la Sclerotinia trifoliorum Erikss. en la R. Argentina. Rev. Fac. Agron. Univ. La Plata 15: 65-67. 1923.

RED CLOVER

5. Ware, W. M. Violet felt rot (Rhizoctonia) of clover. Jour. Min. Agr. Great Britain 30: 48-52. April 1923.
6. Young, W. J. An investigation of clover root rot. (Abstract) Phytopath. 14: 63. Jan. 1924.
7. ―――――― Clover root rots and powdery mildew. Mo. Bul. Ohio Agr. Exp. Sta. 8: 157-160. 1923.

SWEET CLOVER

Mosaic, cause undetermined. Although mosaic was reported on this host only from New York, Michigan, and North Dakota, it doubtless occurred in many other states. In New York it was very common on Melilotus alba and M. officinalis throughout the state. In Michigan it was reported by a grower as causing damage and was probably widespread in the state. In North Dakota it was noticed by collaborators in only one field.

Ascochyta sp. was noted by Edgerton at Baton Rouge, Louisiana, in April. This is the first report from the state. It was of some importance but only plants showing insufficient nodule inoculation were badly affected.

Anthracnose caused by Colletotrichum trifolii Bain was severe locally in Mississippi, according to Neal and Barker.

Mycosphaerella lethalis was generally destructive on full grown stems of Melilotus alba in New York, according to Chupp and Kirby.

COWPEA

Leafspot caused by Cercospora cruenta Sacc. - New Jersey, Delaware, Florida, Porto Rico, Mississippi, Louisiana, Texas, and Oklahoma all reported this disease. In Delaware and Florida, where considerable defoliation occurred, it was said to be the most important leaf spot. Three percent loss was estimated for Florida, 1 to 3% for Louisiana, and 2% for Texas.

Wilt caused by Fusarium vasinfectum tracheiphilum EFS. was reported from North Carolina (noted in two counties), Florida (common, one seven-acre field at Palma Sola a total loss), Mississippi (most serious disease of cowpeas), Texas (1% loss). (Reference: Mix, A. J. and Dorothy Lee Vaughn. The range of toleration of hydrogen-ion concentration exhibited by Fusarium tracheiphilum in culture. (Abstract) Phytopath. 14: 63. Jan. 1924.)

Powdery mildew caused by Erysiphe polygoni DC. Connecticut, New Jersey, Delaware, South Carolina, Mississippi, and California reported powdery mildew. Their reports indicate that it was generally distributed and more abundant than usual. No serious damage was mentioned, however. G. P. Clinton reports a case of abundant infection on Blackeye cowpea with only a very slight infection on New Era growing beside it.

Leafspot caused by Amerosporium oeconomicum E. & T. - New Jersey, Delaware (general), South Carolina (generally prevalent), Florida (widespread, very serious in vicinity of Gainesville).

Bacterial spot caused by Bacterium vignae Gardner & Kendrick. This disease, recently described for the first time (1), was reported to the Survey by Gardner and Kendrick as worse than last year in Indiana, but important only on the crop grown for seed. They also report the disease on specimens received from W. B. Tisdale and collected at Quincy, Florida. Since the disease is seedborne it probably occurs rather widely, although reports have been received by this office only from Indiana, Florida, and Kansas. The Kansas report was accompanied by specimens which were determined by Gardner as being affected with B. vignae.

Fifteen varieties of Vigna sinensis, V. catjang and Phaseolus lunatus macrocarpus are susceptible according to Gardner and Kendrick.

Rust caused by Uromyces appendiculatus (Pers.) Lev. (cowpea strain) - Reported from Louisiana (slight), Texas, and California (on account of susceptibility of certain varieties such as Blackeye their culture is restricted to dryer portions of the State).

Leafspot caused by Phyllosticta phaseolina Sacc. Reported from Delaware.

Damping off caused by Rhizoctonia sp. - Virginia (in small spots on a field of Grey Crowder variety), Florida (scattered infections in seedling stage, some severe).

Root rot caused by Ozonium omnivorum Shear - Texas (prevalent).

Yeast spot caused by Nematospora phaseoli Wingard - Observed by H. W. Anderson for the first time in Illinois, November 5, 1923.

Pod rot caused by Botrytis sp. - Delaware.

A disease having the appearance of mosaic - reported from Payne County, Oklahoma.

Sun scorch - Delaware (general).

Reference:

1. Gardner, Max W., and James B. Kendrick. Bacterial spot of cowpea. Science n.s. 57: 275. Mar. 2, 1923.

SOY BEANS

Bacterial pustule caused by Bacterium phaseoli sojense Hedges was reported by Miss Hedges (1) as known to occur in Texas, Virginia, Louisiana, South Carolina, and Kansas. A report is also at hand of the first collection of the disease in Delaware in 1923. In Louisiana, Edgerton estimates the disease as of considerable importance causing spotting of the leaves with some defoliation and occurring in all sections.

Bacterial blight caused by Bacterium glycineum Coerper - reported from Indiana (serious in seed crop, spotting leaves and pods, worse than usual) and South Carolina (important locally).

Pod and stem blight caused by Diaporthe sojae Lehman - Reported from North Carolina (2) and Indiana (noted in one field on Dunfield and Midwest varieties, September 14, fungus cultured and identified).

Downy mildew caused by Peronospora sojae has been described by Lehman and Wolf from North Carolina (3).

Fusarium wilt caused by Fusarium sp. - reported from Virginia (occurred in spots in field near Richmond), North Carolina (specimens received from one county, probably prevalent in others) and Louisiana (traces, first time disease has been noted).

SOY BEANS

Mosaic (undet.) reported from New York, Virginia, and Indiana. In the latter state it was said to be serious locally, one seed grower failing to obtain certification on account of it. The plants are stunted and the yield of seed reduced.

> "Prof. F. E. Robbins found mosaic in four out of twenty-seven fields inspected. Soysota shows resistance. Midwest is very susceptible." (Gardner & Kendrick)

Leafspot caused by Bacillus lathyri Manns & Taub. - Delaware.

Lightning injury - Delaware.

References:

1. Hedges, Florence. Soy bean pustule. Comparative studies with Bacterium phaseoli sojense Hedges and Bacterium phaseoli EFS. (Abstract) Phytopath. 14: 27-28. Jan. 1924.
2. Lehman, Samuel G. Pod and stem blight of soybean. Annals Missouri Bot. Gard. 10: 111-178. April 1923.
3. Lehman, S. G., and Frederick A. Wolf. A new downy mildew on soy beans. (Abstract) Phytopath. 14: 28. Jan. 1924.

VETCH

Leafspot caused by Ascochyta pisi Lib. In Delaware leaf and stem infection was very severe in some fields.

VELVET BEAN

Leafspot caused by Amerosporium oeconomicum E. & T. - collected near Gainesville, Florida.

Leafspot caused by Bacterium sp. - Louisiana.

Southern blight caused by Sclerotium rolfsii Sacc. was widespread and of serious consequence during the past season in Florida.

B. GRASSES

TIMOTHY

Rust caused by Puccinia phlei-pratensis Erikss. & Henn. Connecticut, New York, Kentucky, Minnesota, Iowa, Montana, and Washington reported this rust.

Smut caused by Ustilago striaeformis (Westend.) Niessl. - Reported from New York, Kentucky, Indiana, Illinois, Minnesota, and Iowa. In New York,

R. S. Kirby surveyed twenty fields for this smut and found an average of 5% in two fields with some spots running as high as 15%. Eight other fields had less than 1%. In Illinois a maximum of 20% was found in one field.

Leafspot caused by Scolecotrichum graminis Fckl. Collected in New York (one of the most, if not the most, destructive diseases of timothy, killing the leaves and probably causing a loss of about 2% for the state) and Minnesota (general throughout the state).

Take-all caused Ophiobolus cariceti B. & Br. Reported from New York (important only as a carrier).

Leafspot caused by Heterosporium phlei Gregory - New York.

Leafspot caused by Septoria sp. - Illinois. (Most common timothy disease; general; damage questionable).

MISCELLANEOUS GRASSES

Aplanobacter agropyri O'Gara
Agropyron smithii Rydb. - Nebraska, first report of this disease from Nebraska, specimens received.

Bacterium albopracipitans Rosen
A new disease, reported by Rosen (9) from Arkansas on the following:
Chaetochloa geniculata (Lam.) Millsp. & Chase
Chaetochloa italica (L.) Scribn.
Chaetochloa lutescens (Weigel) Stuntz

Bacterium coronafaciens atropurpureum Reddy & Godkin (8)
Described on - Agropyron repens (L.) Beauv. and Bromus inermis Leyss. (natural infections) and other species of Bromus (inoculation) - Wisconsin, North Dakota; reported by collaborators on brome grass in North Dakota.

Bacterium panici Elliott (5)
Panicum miliaceum L. - Wisconsin, South Dakota.

Claviceps purpurea (Fr.) Tul.
Agropyron sp. - New York, Montana.
Agropyron repens (L.) Beauv. - New York, Michigan, Minnesota.
Agropyron smithii Rydb. - Minnesota.
Bromus inermis Leyss. - Minnesota, North Dakota.
Calamagrostis neglecta (Ehrh.) Gaertn. - Minnesota.
Elymus sp. - Montana.
Elymus macounii Vasey - Minnesota
Festuca elatior L. - New York.
Paspalum sp. - Florida.

Colletotrichum cereale Manns
Agropyron repens (L.) Beauv. - New York.
Agrostis palustris Huds. - New York.
Anthoxanthum odoratum L. - New York.
Bromus secalinus L. - New York.
Festuca elatior L. - New York.

Holcus halepensis L. - Mississippi.
Poa pratensis L. - New York, Ohio.

Cuscuta gronovii Willd.
Agropyron repens (L.) Beauv. - New York. Observed only under swamp conditions.

Epichloë typhina (Pers.) Tul.
Elymus canadensis L. - Minnesota.

Erysiphe graminis D.C.
Agropyron repens (L.) Beauv. - New York.
Agrostis sp. - Minnesota.
Dactylis glomerata L. - New York.
Elymus canadensis L. - New York.
Elymus virginicus L. - New York.
Poa pratensis L. - Connecticut, New York, Minnesota, Missouri.
Poa compressa L. - Minnesota.

Fusarium sp.
Paspalum sp. - Florida.
Paspalum dilatatum Poir. - Mississippi.

Helminthosporium sp.
Agropyron smithii Rydb. - New York.
Chloris gayana Kunth - Florida.
Dactylis glomerata L. - New York.
Elymus virginicus L. - New York.
Festuca elatior L. - New York.
Holcus halepensis L. - Florida.
Stenotaphrum secundatum (Walt.) Kuntze - Florida.

Helminthosporium bromi Diedicke
Bromus inermis Leyss. - New York, North Dakota.

Helminthosporium cyclops Drechsler (4)
Danthonia spicata (L.) Beauv. - Massachusetts (1920), Maine (1921).

Helminthosporium dictyoides Drechsler (4)
Festuca elatior L. - New York, Connecticut, Massachusetts, Maine, District of Columbia, Maryland, Virginia.

Helminthosporium halodes Drechsler (4)
Distichlis spicata (L.) Greene - New York (1920).

Helminthosporium leucostylum Drechsler (4)
Eleusine indica (L.) Gaertn. - District of Columbia (1921).

Helminthosporium micropus Drechsler (4)
Paspalum boscianum Flügge - Florida (1921).

Helminthosporium monoceras Drechsler (4)
Echinochloa crusgalli (L.) Beauv. - New York (1920).

Helminthosporium ravenelii Curt.
Sporobolus berteroanus (Trin.) Hitchc. & Chase (S. indicus (L.) R. Br.) - Florida (always attacked, 100% infected, and usually every head on the plant, hence the name "smut grass").

Helminthosporium rostratum Drechsler (4)
Eragrostis major Host - District of Columbia (1921).

Helminthosporium sativum P. K. & B.
Agropyron repens (L.) Beauv. - New York.

Helminthosporium siccans Drechsler (4)
Lolium multiflorum Lam. and L. perenne L. - Maryland, District of Columbia, Virginia.

Helminthosporium stenacrum Drechsler (4)
Agrostis stolonifera L. - Connecticut (1920).

Helminthosporium triseptatum Drechsler (4)
Notholcus lanatus (L.) Nash - New York (1920).

Helminthosporium vagans Drechsler (4)
Poa pratensis L. - described from Wisconsin, New York, Illinois, Maryland, District of Columbia, Massachusetts, Connecticut, Maine; reported by collaborators from New York and Indiana.

Mosaic (cause undetermined)

Brandes and Klaphaak (1) report that mosaic, proved by inoculation to be identical with that of sugar cane, has been collected on the following grass hosts:

Brachiaria platyphylla (Griseb.) Nash - Louisiana (New Orleans, 1920).
Chaetochloa magna (Griseb.) Scribn. - Florida (Dade County, 1920).
Paspalum boscianum Flügge - Georgia (Cairo, 1919 and 1920; Reno, 1920), Florida (Marianna, 1920).
Pennisetum glaucum (L.) R. Br. (pearl millet) - Georgia (Cairo, 1921).
Syntherisma sanguinalis (L.) Dulac - Georgia (Cairo, 1919; Reno, 1920), Florida (Chattahoochee and Marianna, 1920), Louisiana (New Orleans, 1919 and 1920; Plaquemine, 1920).

In addition, the following grasses (besides corn, sorghum, and sugar cane) were shown by inoculation to be susceptible:

Chaetochloa lutescens (Weigel) Stuntz.
Echinochloa crusgalli (L.) Beauv.
Miscanthus sinensis Anderss.
Panicum dichotomiflorum Michx.
Saccharum narenga (S. P. I. No. 38332) (wild sugar cane).

Ophiobolus cariceti (Berk. & Br.) Sacc.
Reported by Kirby from New York on the following:
Agropyron repens (L.) Beauv. - important as a harborer of this pathogene.
Agrostis palustris Huds. - trace, June 30, Cayuga County.
Bromus secalinus L. - June 30, Oswego County.

Phyllachora graminis (Pers.) Fckl.
Reported by Kirby from New York on the following:

MISCELLANEOUS GRASSES

Agropyron repens (L.) Beauv.
Agropyron smithii Rydb.
Elymus canadensis L.
Elymus striatus Willd.
Elymus virginicus L.
Hystrix patula Moench

Piricularia grisea (Cke.) Sacc.
Chaetochloa italica (L.) Scribn. - Delaware.
Syntherisma sanguinalis (L.) Dulac - Florida.

Puccinia andropogonis Schw.
Andropogon scoparius Michx. - New York.

Puccinia coronata Corda
Achyrodes aureum (L.) Kuntze - (3).
Festuca elatior L. - New York.

Puccinia dispersa Erikss.
Achyrodes aureum (L.) Kuntze - (3).

Puccinia glumarum (Schm.) Erikss. & Henn.
Lolium sp. - Washington.

Puccinia graminis Pers.
Achyrodes aureum (L.) Kuntze - (3).
Agropyron sp. - Colorado.
Agropyron repens (L.) Beauv. - New York, Indiana, Illinois, Minnesota.
Agropyron smithii Rydb. - New York, Minnesota, Colorado.
Agropyron tenerum Vasey - Minnesota.
Agrostis palustris Huds. - Connecticut, New York, Illinois, Wisconsin, Minnesota.
Anthoxanthum odoratum L. - New York,
Dactylis glomerata L. - New York, Kentucky, Indiana, Minnesota, Montana.
Elymus sp. - Colorado.
Elymus canadensis L. - New York, Minnesota.
Elymus macounii Vasey - Minnesota.
Festuca elatior L. - New York.
Hordeum jubatum L. - Minnesota, Indiana, Colorado.
Poa compressa L. - Michigan, Indiana (found in about six localities).
Tripsacum sp. - Florida.

Puccinia montanensis Ellis
Achyrodes aureum (L.) Kuntze (3)

Puccinia muhlenbergiae Arth. & Holw.
Muhlenbergia sylvatica Torr. - New York.

Puccinia pattersoniana Syd.
Agropyron spicatum (Pursh) Scribn. & Smith - Utah (6).

MISCELLANEOUS GRASSES

Puccinia phlei-pratensis Erikss. & Henn.
Dactylis glomerata L. - New York.

Puccinia poarum Niels.
Achyrodes aureum (L.) Kuntze - (3).
Poa pratensis L. - New York.

Puccinia triticina Erikss.
Achyrodes aureum (L.) Kuntze - (3).
Agropyron repens (L.) Beauv. - New York.
Elymus canadensis L. - New York.
Elymus virginicus L. - New York.

Rhizoctonia solani Kühn (brown patch disease)
Agrostis palustris Huds. - New York.
Capriola dactylon (L.) Kuntze - Florida.
Poa pratensis L. - New York.
Lawn grass - Connecticut.

Sclerospora graminicola (Sacc.) Schr.
Alopecurus geniculatus L. - Mississippi.
Chaetochloa magna (Griseb.) Scribn. - Florida.
Chaetochloa viridis (L.) Scribn. - New York, Minnesota, Iowa.

Scolecotrichum graminis Fckl.
Agrostis palustris Huds. - New York.
Anthoxanthum odoratum L. - New York.
Dactylis glomerata L. - New York, Missouri.
Poa sp. - Missouri.
Poa compressa L. - Minnesota.
Poa pratensis L. - New York.

Septoria graminum Desm.
Hierochloë odorata Wahl. - Minnesota.

Sorosporium syntherismae (Pk.) Farl.
Andropogon sp. - Colorado.

Urocystis agropyri (Preuss) Schröt.
Agropyron sp. - Missouri.
Agropyron repens (L.) Beauv. - New York.

Ustilago hypodites (Schlect.) Fr.
Agropyron repens (L.) Beauv. - Abundant in at least one orchard at Hall, New York, July 9. - Found in a field at Ithaca New York July 7.

Ustilago longissma (Sow.) Tul.
Panicularia grandis (S. Wats.) Nash (Glyceria grandis S. Wats.) - New York.

Ustilago neglecta Niessl.
Chaetochloa lutescens (Weigel) Stuntz - New York.

MISCELLANEOUS GRASSES

Ustilago panici-miliacei (Pers.) Wint.
Panicum miliaceum L. - North Dakota.

Ustilago pustulata Tracy & Earle
Panicum dichotomiflorum Michx. - New Jersey.

Ustilago rabenhorstiana Kühn
Panicum dichotomiflorum - District of Columbia.
Syntherisma sanguinalis (L.) Dulac. - New York.

Ustilago striaeformis (Westend.) Niessl
Agrostis palustris Huds. - New York, Massachusetts.
Poa compressa L. - Indiana.
Poa pratensis L. - Massachusetts, Kentucky, New York, Indiana.

Wojnowicia graminis (McAlp.) Sacc. & D. Sacc.
Agropyron repens (L.) - New York.

Vermicularia sp.
Eleusine sp. - Florida.

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10. Stakman, E. C., and M. N. Levine. Puccinia graminis on Poa spp. in the United States. (Abstract). Phytopath. 14: 39. Jan. 1924.

C. MISCELLANEOUS

SUNFLOWER

Rust caused by *Puccinia helianthi* Schw. was reported from Connecticut (very common on dwarf sunflower and Mammoth Russian at Station farm), New York (on *H. annuus* and *H. tuberosus*), New Jersey (flowers nearly mature before leaves were severely diseased), Florida, Oklahoma, Michigan (started late; caused complete defoliation at Agricultural College in October, severe in lower part of state but slight in Upper Peninsula), Wisconsin, Minnesota (of considerable importance locally, causing defoliation in some cases), Colorado, New Mexico (common on wild sunflowers all over the Valley), Arizona, Idaho, and Washington.

Wilt caused by *Sclerotinia libertiana* Fckl. - Michigan and Idaho are the only states reporting this disease in 1923. In Canada, however, it was reported from six provinces from British Columbia on the West to Prince Edward Island on the East. (Survey of the prevalence of plant diseases in the Dominion of Canada, 1923).

References:

Baribeau, B. Fletrissure et pourriture de la tige du tournesol dans la province de Quebec. (Sunflower wilt in the province of Quebec.) Sci. Agri. 3: 397-400. 1923.

Jones, E. S. Taxonomy of the Sclerotinia on Helianthus annuus L. Phytopath. 13: 496-500. Nov. 1923.

Downy mildew caused by *Plasmopara halstedii* (Farl.) Berl. & De Toni - New York (on *Helianthus annuus*, *H. longifolius*, and *H. rigidus*), and Minnesota (killing of plants and severe stunting).

Powdery mildew caused by *Erysiphe cichoracearum* DC. - Connecticut, New York, and Washington.

Leaf spot caused by *Septoria helianthi* E. & K. - Connecticut, New York, Michigan, and Minnesota.

General reference:

Gilbert, H. C. and A. W. Henry. Minnesota sunflower diseases in 1923. (Abstract) Phytopath. 14: 64. Jan. 1924.

CROP LOSSES FROM PLANT DISEASES IN THE UNITED STATES IN 1923

Plant Disease Reporter
Supplement 36

December 30, 1924

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INTRODUCTORY STATEMENT

Through its system of state collaborators the Plant Disease Survey for a number of years has made estimates of losses from plant diseases of some of the major crops. The estimates for 1923, herewith presented, are the seventh of the series that have been issued by the office. The methods followed in preparing these estimates have been the same as those used in previous years. (See Plant Disease Bulletin, Supplements 6, 12, 24, and 30.)

Estimated percentage loss to twelve crops from
plant diseases 1919 to 1923.

Crop	Percent loss				
	1919	1920	1921	1922	1923
Wheat	16.96	11.70	9.2	8.9	11.82
Rye	1.74	1.98	1.4	1.9	2.32
Barley	5.90	4.60	5.7	4.6	5.69
Oats	5.90	4.80	8.6	5.6	6.06
Corn	6.41	6.39	8.8	6.0	10.7
Potato	19.50	21.70	18.6	21.1	16.20
Sweet potato	36.23	25.8	28.3	21.49	20.9
Dry bean	3.70	4.3	14.1	16.1	10.0
Cotton	13.59	13.4	15.8	9.2	19.5
Apple	11.37	16.5	11.3	22.5	13.20
Peach	12.04	19.4	15.3	18.6	6.0
Pear					7.42

WHEAT

Estimated reduction in yield of wheat due to scab (Gibberella saubinetti), leaf rust (Puccinia triticina), stem rust (Puccinia graminis), and bunt (Tilletia laevis and T. tritici), 1923.

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease							
		Scab		Leaf rust		Stem rust		Bunt	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	156	-	-	-	-	-	-	-	-
Vt.	84	0	0	1	1	1	1	-	-
Mass.		0	0	-	-	1	+	t	+
Conn.		0	0	-	-	-	-	-	-
N. Y.	8,159	t	+	1	83	t	+	.03	3
N. J.	1,480	0.5	7	0.2	3	0.5	8	t	+
Pa.	24,338	2	526	1.5	395	t	+	t	+
Del.	1,908	0.1	2	0.2	4	-	-	0.1	2
Md.	10,426	1	112	1.5	169	t	+	1.5	169
Va.	11,145	t	+	1	118	0.2	24	1	118
W. Va.	2,964	1	31	1	31	t	+	t	+
N. C.	6,038	1	73	3	218	1	72	3	218
S. C.	1,925	-	-	2	42	-	-	-	-
Ga.	1,739	0	0	5	99	-	-	1	20
Ohio	42,783	0.5	252	4	2,015	2	1,008	0.1	50
Ind.	34,248	t	+	2	753	t	+	1	376
Ill.	62,506	2.2	1,601	3	2,183	1.5	1,091	4	2,911
Mich.	16,576	t	+	t	+	2	345	0.5	86
Wis.	1,970	t	+	t	+	1	20	t	+
Minn.	20,785	0.3	79	t	+	15	3,932	t	+
Iowa	14,352	4	624	1.5	234	1	156	0.5	78
Mo.	37,947	2	791	1	395	-	-	t	+
N. Dak.	58,660	1	761	1	762	12	9,142	t	+
S. Dak.	26,906	10	3,495	1	349	10	3,495	1	349
Nebr.	31,388	t	+	1	341	4	1,365	-	-
Kans.	83,804	0	0	1	913	1	913	t	+
Ky.	7,688	1	83	1	84	0	0	t	+
Tenn.	4,508	4	196	2	98	1	49	t	+
Ala.	200	t	+	5	11	t	+	-	-
Miss.	60	t	+	1	+	t	+	-	-
La.		0	0	*-	-	*-	-	0	0
Texas	16,370	t	+	1	174	2	348	0.5	87
Okla.	36,300	-	-	-	-	-	-	-	-
Ark.	770	1	9	4	37	1	9	3	28
Mont.	52,486	0	0	-	-	18	11,809	-	-
Wyo.	2,785	0	0	-	-	t	+	-	-
Colo.	18,000	0	0	1	203	10	2,033	0.5	102
N. Mex.	1,300	0	0	-	-	-	-	-	-
Ariz.	1,092	0	0	-	-	t	+	-	-
Utah	6,566	0	0	0.3	20	1.5	102	t	+
Nev.	507	0	0	-	-	1	5	-	-
Idaho	30,115	0	0	t	+	1	346	8	2,770
Wash.	61,743	0	0	t	+	t	+	6	3,941
Oregon	26,807	0	0	t	+	0	0	-	-
Calif.	16,157	0	0	t	+	t	+	-	-
U. S.	785,741	0.97	8,642	1.09	9,735	4.07	36,273	1.27	11,308

State	Estimated reduction in yield due to disease							
	Loose smut		Other diseases		Sum of traces and no data		All diseases	
	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	-	-	-	-	-	-	-	
Vt.	-	-	-	-	0	0	2	2
Mass.	t	+	-	-	1	+	2	+
Conn.	-	-	-	-	2.5	+	2.5	+
N. Y.	0.7	59	1.1	92	0	0	2.83	237
N. J.	1	15	0.8	12	-	-	3	45
Pa.	3	790	1	263	0	0	7.5	1,974
Del.	0.8	15	1.5	29	0	0	2.7	52
Md.	3	338	0.5	57	0	0	7.5	845
Va.	3	354	0.5	59	0	0	5.7	673
W. Va.	3	95	-	-	1	32	6	189
N. C.	5	364	4	291	0	0	17	1,236
S. C.	2	42	-	-	4	83	8	167
Ga.	3	59	3	59	0	0	12	237
Ohio	1.5	756	7	3,528	0	0	15.1	7,609
Ind.	3	1,129	-	-	3	1,129	9	3,387
Ill.	1.9	1,383	1.5	1,091	0	0	14.1	10,260
Mich.	1.5	259	-	-	0	0	4	690
Wis.	1	20	t	+	1	21	3	61
Minn.	0.4	105	5	1,310	0	0	20.7	5,426
Iowa	1	156	t	+	0	0	8	1,248
Mo.	1	395	-	-	0	0	4	1,581
N. Dak.	2	1,524	7	5,333	0	0	23	17,522
S. Dak.	t	+	1	349	0	0	23	8,037
Nebr.	t	+	-	-	3	1,023	8	2,729
Kans.	1.2	1,095	5	4,564	0	0	8.2	7,485
Ky.	1.4	118	5	420	0	0	8.4	705
Tenn.	t	+	1	49	0	0	8	392
Ala.	2	4	2	4	0	0	9	19
Miss.	1	1	3	2	0	0	5	3
La.	t	+	-	-	6	+	6	+
Texas	0.5	87	2	349	0	0	6	1,045
Okla.	-	-	-	-	7	2,732	7	2,732
Ark.	3	28	5	46	0	0	17	157
Mont.	-	-	-	-	2	1,312	20	13,121
Wyo.	-	-	-	-	2	56	2	56
Colo.	t	+	0	0	0	0	11.5	2,338
N. Mex.	-	-	-	-	-	-	-	-
Ariz.	t	+	-	-	-	-	+	+
Utah	1.2	81	-	-	-	-	3	203
Nev.	-	-	-	-	-	-	1	5
Idaho	2	692	2	692	0	0	13	4,500
Wash.	t	+	t	+	-	-	6	3,941
Oregon	-	-	-	-	10	2,978	10	2,978
Calif.	t	+	-	-	8	1,405	8	1,405
U. S.	1.12	9,964	2.09	18,599	1.21	10,771	11.82	105,292

RYE

Estimated reduction in yield of rye due to smut (*Urocystis occulta*), ergot (*Claviceps purpurea*), leaf rust (*Puccinia dispersa*), stem rust (*Puccinia graminis*), and other diseases, 1923.

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease													
		Smut		Ergot		Leaf rust		Stem rust		Other diseases		Sum of traces and no data		All diseases	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Mass.	54	t	+	t	+	6	3	1	1	-	-	1	+	8	4
Conn.	90	0	0	t	+	1	1	1	1	-	-	1	+	3	2
N. Y.	945	0.1	1	t	+	1	10	0.1	1	1	9	0	0	2.2	21
N. J.	1,157	0.2	2	0.3	4	0.7	8	0.1	1	0.5	6	-	-	1.8	21
Pa.	3,655	-	-	-	-	-	-	-	-	-	-	2	74	2	74
Del.	86	-	-	-	-	0.2	+	-	-	1	1	0	0	1.2	1
Md.	269	t	+	-	-	1	3	t	+	t	+	1	2	2	5
Va.	504	t	+	t	+	1	5	-	-	3	16	-	-	4	21
W. Va.	100	t	+	t	+	t	+	t	+	t	+	2	2	2	2
N. C.	603	-	-	-	-	-	-	-	-	-	-	3	18	3	18
S. C.	74	-	-	-	-	0.5	+	-	-	2	2	1	+	3.5	2
Ga.	180	t	+	-	-	1	1	-	-	1	2	0	0	2	3
Ohio	1,302	-	-	0.5	8	3	49	2	33	15	246	0	0	20.5	336
Ind.	4,186	-	-	-	-	t	+	-	-	-	-	2	85	2	85
Ill.	3,450	1	35	t	+	1	35	t	*	0.5	18	0	0	2.5	88
Mich.	6,538	t	+	t	+	t	+	t	+	-	-	1	66	1	66
Wis.	5,062	t	+	0.3	16	t	+	0.1	5	t	+	1	51	1.4	72
Minn.	12,312	1	126	t	+	t	+	t	+	1	126	0.5	63	2.5	315
Iowa	923	t	+	3	29	t	+	t	+	-	-	1	9	4	38
Mo.	325	-	-	-	-	*	-	-	-	-	-	2	7	2	7
N. Dak.	10,045	t	+	0.5	51	t	+	0.5	51	t	+	0.5	50	1.5	152
S. Dak.	3,496	-	-	0.5	18	*0	0	1	35	-	-	0.5	18	2	71

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease: Smut %	Smut Bushels (000 omitted)	Ergot %	Ergot Bushels (000 omitted)	Leaf rust %	Leaf rust Bushels (000 omitted)	Stem rust %	Stem rust Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
Nebr.	1,584	–	–	–	–	*–	–	–	–	–	–	2	32	2	32
Kans.	348	0	0	0	0	t	+	t	+	1	3	0.5	2	1.5	5
Ky.	234	t	+	t	+	t	+	0	0	–	–	1	2	1	2
Tenn.	200	–	–	–	–	t	+	–	–	6	13	1	2	7	15
Ala.	12	–	–	–	–	0.5	+	–	–	1	+	0	0	1.5	+
Miss.		0	0	0	0	t	+	0	0	10	+	0	0	10	+
La.		0	0	0	0	t	+	–	–	–	–	1	+	1	+
Texas	204	–	–	–	–	–	–	–	–	–	–	1	2	1	2
Okla.	444	–	–	–	–	–	–	–	–	–	–	1	4	1	4
Ark.	9	*	–	0	0	3	+	0	0	5	1	0	0	8	1
Mont.	2,112	–	–	–	–	*	–	0	0	–	–	1	21	1	21
Wyo.	312	–	–	–	–	–	–	–	–	–	–	1	3	1	3
Colo.	876	0	0	0	0	*0	0	t	+	0	0	–	–	+	+
N. Mex.	24	–	–	–	–	–	–	–	–	–	–	–	–	–	–
Utah	125	–	–	t	+	–	–	–	–	–	–	1	1	1	1
Nev.		–	–	–	–	–	–	–	–	–	–	1	+	1	+
Idaho	266	–	–	t	+	–	–	t	+	–	–	1	2	1	2
Wash.	190	0	0	0	0	0	0	t	+	t	+	t	+	t	+
Oregon	555	–	–	–	–	–	–	–	–	–	–	1	5	1	5
Calif.		–	–	–	–	*–	–	0	0	–	–	1	+	1	+
U. S.	62,852	.25	164	.19	126	.18	115	.20	128	.69	443	.81	521	2.32	1497

BARLEY

Estimated reduction in yield of barley due to stripe (*Helminthosporium gramineum*), loose smut (*Ustilago nuda*), and covered smut (*Ustilago hordei*), 1923.

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease					
		Stripe		Loose smut		Covered smut	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	90	-	-	-	-	-	-
N. H.	26	-	-	-	-	-	-
Vt.	261	-	-	1	2	1	3
Mass.		-	-	2	+	-	-
Conn.		-	-	1	+	1	+
N. Y.	5,092	t	+	2	107	0.7	37
Pa.	269	-	-	-	-	1.5	4
Del.		t	+	t	+	1.5	+
Md.	132	t	+	2	3	2	3
Va.	270	t	+	4	11	2	6
Ga.		-	-	3	+	1	+
Ohio	1,998	-	-	0.5	10	-	-
Ind.	690	1	7	5	37	1	8
Ill.	6,612	3	210	2.5	174	0	0
Mich.	3,600	-	-	-	-	-	-
Wis.	13, 252	t	+	-	-	t	+
Minn.	24,050	1	263	1	263	0.2	53
Iowa	4,572	5	279	1	55	1	56
Mo.	162	-	-	-	-	-	-
N. Dak.	23,818	1	256	1	256	1	256
S. Dak.	20,025	1	215	1	215	t	+
Nebr.	9,492	t	+	-	-	-	-
Kans.	21,467	0	0	3	685	2	457
Ky.	189	-	-	2.5	5	6	13
Tenn.	391	-	-	1	4	1	4
Miss.		-	-	2	+	1	+
La.		t	+	-	-	-	-
Texas	2,592	t	+	0.5	13	0.5	14
Okla.	2,838	-	-	-	-	-	-
Mont.	2,474	-	-	-	-	-	-
Wyo.	868	-	-	-	-	-	-
Colo.	6,409	2	139	0.5	35	0.5	35
N. Mex.	209	-	-	-	-	-	-
Ariz.	1,260	-	-	-	-	-	-
Utah	893	-	-	-	-	-	-
Nev.	152	-	-	-	-	-	-
Idaho	3,999	t	+	t	+	1	41
Wash.	3,884	t	+	0	0	t	+
Oregon	3,080	-	-	-	-	-	-
Calif.	33,069	-	-	-	-	-	-
U. S.	198,185	.65	1,369	.89	1,875	.47	990

BARLEY (continued)

Estimated reduction in yield of barley due to leaf rust (*Puccinia simplex*), stem rust (*Puccinia graminis*), and other diseases, 1923.

State	Estimated reduction in yield due to disease									
	Leaf rust		Stem rust		Other diseases		Sum of traces and no data		All diseases	
	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	-	-	-	-	-	-	-	-	-	-
N. H.	-	-	-	-	-	-	-	-	-	-
Vt.	-	-	-	-	-	-	-	-	2	5
Mass.	-	-	-	-	-	-	1	+	3	+
Conn.	.05	+	0.5	+	-	-	0	0	2.55	+
N. Y.	t	+	1	53	1+	54	0	0	4.7	251
Pa.	t	+	-	-	-	-	0.5	1	2	5
Del.	-	-	-	-	0.5	+	0.5	+	2.5	+
Md.	t	+	t	+	t	+	0.5	+	4.5	6
Va.	t	+	-	-	-	-	0.5	1	6.5	18
Ga.	1	+	0	0	2	+	0	0	7	+
Ohio	-	-	0.5	10	2	42	0.5	10	3.5	72
Ind.	-	-	-	-	-	-	0	0	7	52
Ill.	0	0	0	0	0	0	0	0	5.5	384
Mich.	-	-	-	-	-	-	-	-	-	-
Wis.	-	-	1	135	-	-	1	135	2	270
Minn.	0	0	1.5	396	5	1,317	0	0	8.7	2,292
Iowa	-	-	4	223	7	390	0	0	18	1,003
Mo.	-	-	-	-	-	-	-	-	-	-
N. Dak.	0	0	3	768	1	256	0	0	7	1,792
S. Dak.	-	-	5	1,077	t	+	0	0	7	1,507
Nebr.	0	0	t	+	-	-	3	293	3	293
Kans.	0	0	t	+	1	228	0	0	6	1,370
Ky.	t	+	0	0	-	-	0	0	8.5	18
Tenn.	-	-	-	-	5	21	0	0	7	29
Miss.	0	0	0	0	t	+	-	-	3	0
La.	t	+	-	-	-	-	2	+	2	+
Texas	1	27	1	27	2	55	0	0	5	136
Okla.	-	-	-	-	-	-	-	-	-	-
Mont.	-	-	-	-	-	-	-	-	-	-
Wyo.	-	-	-	-	-	-	-	-	-	-
Colo.	0	0	5	348	0	0	0	0	8	557
N. Mex.	-	-	-	-	-	-	-	-	-	-
Ariz.	-	-	t	+	-	-	-	-	+	+
Utah	-	-	-	-	-	-	-	-	-	-
Nev.	-	-	-	-	-	-	-	-	-	-
Idaho	t	+	t	+	1	41	0.5	20	2.5	102
Wash.	0	0	0	0	t	+	t	+	t	+
Oregon	-	-	-	-	-	-	2	62	2	62
Calif.	-	-	-	-	-	-	5	1,740	5	1,740
U. S.	.01	27	1.45	3,037	1.14	2,404	1.08	2,262	5.69	11,964

OATS

Estimated reduction in yield of oats due to loose and covered smuts (Ustilago avenae and U. levis), stem rust (Puccinia graminis), crown rust (Puccinia coronata), and other diseases, 1923.

State	Production: 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease											
		Loose and covered smut		Stem rust		Crown rust		Other diseases		Sum of traces and no data		All diseases	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	4,625	-	-	-	-	-	-	-	-	-	-	-	-
N. H.	675	-	-	-	-	-	-	-	-	-	-	-	-
Vt.	3,030	3	100	1.5	49	3	100	-	-	0	0	7.5	249
Mass.	315	8	28	2	7	2	7	-	-	0	0	12	42
R. I.	32	-	-	-	-	-	-	-	-	5	1	5	1
Conn.	290	2	6	1	3	1	3	-	-	0	0	4	12
N. Y.	32,747	4	1,393	t	+	2	697	t	+	0.02	7	6.02	2,097
N. J.	1,632	2.5	42	0.2	3	0.8	14	0.5	9	0	0	4	68
Pa.	33,930	3	1,082	-	-	1	361	2	722	0	0	6	2,165
Del.	182	1.5	3	-	-	0.2	+	1	2	0	0	2.7	5
Md.	1,758	3	55	t	+	t	+	t	+	1	18	4	73
Va.	3,586	5	193	-	-	1	38	1	38	0	0	7	269
W. Va.	4,704	1	48	t	+	t	+	t	+	1	48	2	96
N. C.	5,082	1.8	94	-	-	-	-	-	-	1	52	2.8	146
S. C.	10,728	5	570	-	-	-	-	-	-	1	114	6	684
Ga.	9,378	5	515	-	-	3	309	1	103	0	0	9	927
Fla.	396	t	+	-	-	-	-	-	-	-	-	+	+
Ohio	52,302	t	+	0.5	278	0.5	278	5	2,781	0	0	6	3,337
Ind.	48,692	3	1,554	-	-	2	1,036	-	-	1	518	6	3,108
Ill.	135,100	5.5	8,120	t	+	2.5	3,691	0.5	738	0	0	8.5	12,549
Mich.	48,896	2	1,063	5	2,657	1	531	-	-	0	0	8	4,251
Wis.	92,166	3	2,880	0.5	480	0.5	480	t	+	0	0	4	3,840
Minn.	153,254	5	8,204	1	1,641	0.1	164	0.5	820	0	0	6.6	10,829

State	Production: 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease											
		Loose and covered smuts		Stem rust		Crown rust		Other diseases		Sum of traces and no data		All diseases	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Iowa	203,004	1	2,136	1	2,137	1	2,137	2	4,274	0	0	5	10,684
Mo.	34,500	-	-	-	-	-	-	-	-	3	1,067	3	1,067
N. Dak.	54,924	2	1,277	5	3,193	5	3,193	2	1,278	0	0	14	8,941
S. Dak.	78,336	1	833	4	3,334	1	833	t	+	0	0	6	5,000
Nebr.	81,048	-	-	t	+	t	+	t	+	2	1,654	2	1,654
Kans.	34,922	4	1,486	t	+	t	+	2	743	0	0	6	2,229
Ky.	4,725	10	525	0	0	t	+	-	-	0	0	10	525
Tenn.	4,305	0.5	22	-	-	-	-	1.5	65	0	0	2	87
Ala.	4,792	3	152	t	+	3	153	-	-	0	0	6	305
Miss.	2,280	3	77	0	0	6	153	2	51	0	0	11	281
La.	1,232	t	+	0	0	20	328	5	82	0	0	25	410
Texas	47,040	2	1,012	1	506	2	1,011	2	1,011	0	0	7	3,540
Okla	24,000	-	-	-	-	-	-	-	-	3	742	3	742
Ark.	6,187	8	660	2	165	15	1,237	-	-	0	0	25	2,062
Mont.	22,209	3	686	0	0	0	0	-	-	0	0	3	686
Wyo.	5,950	-	-	-	-	-	-	-	-	2	121	2	121
Colo.	6,336	t	+	2	129	0	0	0	0	0	0	2	129
N. Mex.	1,160	-	-	-	-	-	-	-	-	2	23	2	23
Ariz.	570	2	11	t	+	-	-	-	-	0	0	2	11
Utah	3,062	4.5	144	t	+	-	-	-	-	0	0	4.5	144
Nev.	106	-	-	-	-	-	-	-	-	2	2	2	2
Idaho	7,820	3	247	t	+	-	-	2	164	0	0	5	411
Wash.	11,970	0.5	60	t	+	0	0	t	+	t	+	0.5	60
Oregon	10,530	-	-	-	-	-	-	-	-	-	-	-	-
Calif.	5,265	-	-	-	-	-	-	-	-	-	-	-	-
U. S.	[illegible],323	2.55	35,278	1.05	14,582	1.21	16,754	.93	12,881	.32	4,367	6.06	83,862

Estimated reduction in yield of corn due to smut (Ustilago zeae), leaf rust (Puccinia sorghi), and brown spot (Physoderma zeae-maydis), 1923.

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease					
		Smut		Leaf rust		Brown spot	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	684	-	-	-	-	0	0
N. H.	1,092	-	-	-	-	0	0
Vt.	3,276	1	33	t	+	0	0
Mass.	2,537	0.5	13	t	+	0	0
R. I.	456	-	-	-	-	0	0
Conn.	3,116	3	98	-	-	0	0
N. Y.	24,559	2	522	t	+	0	0
N. J.	9,440	0.5	50	-	-	-	-
Pa.	61,640	3	2,101	t	+	0	0
Del.	6,057	1	64	0	0	0	0
Md.	25,231	1.5	427	t	+	0	0
Va.	53,563	2	1,164	t	+	0	0
W. Va.	20,128	1	208	t	+	0	0
N. C.	58,568	2	1,331	1	665	2	1,331
S. C.	32,670	1	340	-	-	1	340
Ga.	49,215	2.5	1,374	0	0	2	1,100
Fla.	10,250	-	-	-	-	-	-
Ohio	159,859	3	5,449	t	+	t	+
Ind.	192,616	0.4	819	-	-	t	+
Ill.	337,312	3	12,728	0	0	0.5	2,121
Mich.	58,167	1	587	t	+	0	0
Wis.	83,361	0.5	441	0	0	0	0
Minn.	154,692	0.5	781	0	0	0	0
Iowa	430,240	3	15,551	-	-	0	0
Mo.	196,860	2	4,280	-	-	-	-
N. Dak.	28,207	5	1,484	t	+	0	0
S. Dak.	145,176	2	3,089	t	+	0	0
Nebr.	272,052	-	-	-	-	-	-
Kans.	122,149	4	5,817	t	+	0	0
Ky.	87,866	0.5	480	0	0	-	-
Tenn.	73,941	0.5	389	t	+	t	+
Ala.	48,988	2	1,089	t	+	1	544
Miss.	33,742	t	+	t	+	0.5	180
La.	24,702	t	+	1	317	1	317
Texas	96,440	t	+	t	+	-	-
Okla.	37,536	-	-	-	-	-	-
Ark.	39,039	3	1,346	0	0	1	449
Mont.	9,490	-	-	-	-	0	0
Wyo.	4,050	-	-	-	-	0	0
Colo.	37,250	1.5	567	0	0	0	0
N. Mex.	3,624	3	112	-	-	0	0
Ariz.	990	t	+	-	-	0	0
Utah	772	1	7	-	-	0	0
Nev.	23	-	-	-	-	0	0
Idaho	3,066	t	+	-	-	0	0
Wash.	2,738	t	+	0	0	0	0
Oregon	2,485	-	-	-	-	0	0
Calif.	4,480	-	-	-	-	0	0

State	Estimated reduction in yield due to disease									
	Root rots		Ear rots		Other diseases		Sum of traces and no data		All diseases	
	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	-	-	-	-	-	-	-	-	-	-
N. H.	-	-	-	-	-	-	-	-	-	-
Vt.	-	-	-	-	-	-	-	-	1	33
Mass.	2	53	t	+	-	-	1	26	3.5	92
R. I.	-	-	-	-	-	-	5	24	5	24
Conn.	1	33	1	33	t	+	0	0	5	164
N. Y.	1	261	3	784	t	+	0	0	6	1,567
N. J.	4	404	2	202	t	+	0	0	6.5	656
Pa.	4	2,802	4	2,802	1	700	0	0	12	8,405
Del.	3	193	1.5	97	0.5	32	0	0	6	386
Md.	7	1,996	3	855	t	+	0	0	11.5	3,278
Va.	2	1,164	3	1,747	1	582	0	0	8	4,657
W. Va.	1	207	1	207	t	+	0	0	3	622
N. C.	4	2,662	3	1,997	-	-	0	0	12	7,986
S. C.	-	-	-	-	2	681	0	0	4	1,361
Ga.	2	1,100	2	1,100	2	1,100	0	0	10.5	5,774
Fla.	-	-	-	-	-	-	10	1,138	10	1,138
Ohio	1	1,817	5	9,083	3	5,449	0	0	12	21,798
Ind.	5	10,234	0.5	1,023	-	-	0	0	5.9	12,076
Ill.	13	55,158	2	8,486	2	8,486	0	0	20.5	86,979
Mich.	t	+	t	+	0	0	0	0	1	687
Wis.	t	+	5	4,410	-	-	0	0	5.5	4,851
Minn.	0.1	156	0.2	313	0.2	313	0	0	1	1,563
Iowa	t	+	9	46,652	3	15,551	2	10,367	17	88,121
Mo.	t	+	3	6,419	-	-	3	6,419	8	17,118
N. Dak.	t	+	t	+	t	+	0	0	5	1,484
S. Dak.	3	4,633	-	-	-	-	1	1,544	6	9,266
Nebr.	-	-	-	-	-	-	8	23,656	8	23,656
Kans.	4	5,817	5	7,270	3	4,362	0	0	16	23,266
Ky.	-	-	6	5,762	-	-	2	1,920	8.5	8,162
Tenn.	3	2,335	1	778	0.5	389	0	0	5	3,891
Ala.	-	-	5	2,722	-	-	2	1,088	10	5,443
Miss.	4	1,443	1	361	-	-	1	361	6.5	2,345
La.	5	1,583	15	4,750	-	-	0	0	22	6,967
Texas	-	-	2	2,052	2	2,052	2	2,052	6	6,156
Okla.	-	-	-	-	-	-	4	1,564	4	1,564
Ark.	0	0	4	1,795	5	2,243	0	0	13	5,833
Mont.	-	-	-	-	-	-	2	193	2	193
Wyo.	-	-	-	-	-	-	2	82	2	82
Colo.	0	0	0	0	0	0	0	0	1.5	567
N. Mex.	-	-	-	-	-	-	0	0	3	112
Ariz.	-	-	-	-	-	-	2	20	2	20
Utah	-	-	-	-	-	-	0	0	1	7
Nev.	0	0	0	0	-	-	1	+	1	+
Idaho	0	0	0	0	-	-	1	30	1	30
Wash.	0	0	0	0	t	+	t	+	t	+
Oregon	0	0	0	0	-	-	1	25	1	25
Calif.	-	-	-	-	-	-	-	-	-	-
U. S.	2.7	94,051	3.3	111,700	1.2	41,940	1.5	50,509	10.7	368,305

POTATO

Estimated reduction in yield of potato due to mosaic, leaf roll, late blight (Phytophthora infestans), rhizoctonia (Rhizoctonia solani), black leg (Bacillus phytophthorus), and fusarium wilt (Fusarium oxysporum), 1923.

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease											
		Mosaic		Leaf roll		Late blight		Rhizoctonia		Black leg		Fusarium wilt	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	31,992	-	-	-	-	-	-	-	-	t	+	-	-
N. H.	2,405	5	146	10	293	t	+	2	59	t	+	-	-
Vt.	4,320	5	250	5	250	t	+	2	100	-	-	-	-
Mass.	4,550	10	545	5	272	t	+	0.5	27	t	+	-	-
R. I.	330	2	7	3	10	-	-	-	-	-	-	-	-
Conn.	3,565	0.5	21	1	41	0	0	-	-	1	41	-	-
N. Y.	39,729	5	2,759	7	3,862	t	+	5	2,759	t	+	1	552
N. J.	7,600	0.5	45	6	546	-	-	t	+	-	-	5	455
Pa.	26,145	1.5	526	10	3,509	t	+	2	702	2	702	4	1,403
Del.	800	0.5	4	2.5	22	-	-	-	-	-	-	-	-
Md.	3,920	5	236	-	-	3	142	3	142	1	47	-	-
Va.	14,136	3	490	2	327	t	+	3	490	2	327	0.5	82
W. Va.	5,880	-	-	-	-	t	+	t	+	t	+	t	+
N. C.	3,956	8	507	2	127	5	316	6	380	1.5	95	1	63
S. C.	3,136	t	+	-	-	-	-	-	-	-	-	-	-
Ga.	1,540	-	-	-	-	4	66	-	-	-	-	1	16
Fla.	1,748	1.5	29	-	-	5	99	1	20	-	-	-	-
Ohio	12,348	10	1,583	-	-	0	0	3	475	-	-	1	158
Ind.	7,875	0.5	44	5	442	0	0	0.1	9	0.1	9	0.3	27
Ill.	9,568	t	+	0	0	0	0	0	0	t	+	t	+
Mich.	35,796	2	842	5	2,106	t	+	5	2,105	t	+	t	+
Wis.	26,112	2	561	0	0	t	+	1	281	t	+	t	+
Minn.	38,304	1	435	t	+	0	0	3	1,306	1	435	t	+

<table>
<tr><th rowspan="3">State</th><th>Production</th><th colspan="12">Estimated reduction in yield due to disease</th></tr>
<tr><th rowspan="2">1923
Bushels
(000
omitted)</th><th colspan="2">Mosaic</th><th colspan="2">Leaf roll</th><th colspan="2">Late blight</th><th colspan="2">Rhizoctonia</th><th colspan="2">Black leg</th><th colspan="2">Fusarium wilt</th></tr>
<tr><th>%</th><th>Bushels (000 omitted)</th><th>%</th><th>Bushels (000 omitted)</th><th>%</th><th>Bushels (000 omitted)</th><th>%</th><th>Bushels (000 omitted)</th><th>%</th><th>Bushels (000 omitted)</th><th>%</th><th>Bushels (000 omitted)</th></tr>
<tr><td>Iowa</td><td>6,804</td><td>5</td><td>567</td><td>-</td><td>-</td><td>0</td><td>0</td><td>4</td><td>454</td><td>1</td><td>113</td><td>-</td><td>-</td></tr>
<tr><td>Mo.</td><td>9,300</td><td>5</td><td>489</td><td>-</td><td>-</td><td>0</td><td>0</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>N. Dak.</td><td>13,114</td><td>t</td><td>+</td><td>t</td><td>+</td><td>0</td><td>0</td><td>3</td><td>458</td><td>4</td><td>610</td><td>1</td><td>152</td></tr>
<tr><td>S. Dak.</td><td>7,744</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0</td><td>0</td><td>1</td><td>81</td><td>-</td><td>-</td><td>t</td><td>+</td></tr>
<tr><td>Nebr.</td><td>8,880</td><td>2</td><td>201</td><td>-</td><td>-</td><td>0</td><td>0</td><td>t</td><td>+</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Kans.</td><td>5,160</td><td>0.1</td><td>6</td><td>-</td><td>-</td><td>0</td><td>0</td><td>12</td><td>761</td><td>3</td><td>190</td><td>-</td><td>-</td></tr>
<tr><td>Ky.</td><td>4,930</td><td>10</td><td>795</td><td>15</td><td>1,193</td><td>0</td><td>0</td><td>5</td><td>397</td><td>0</td><td>0</td><td>2</td><td>159</td></tr>
<tr><td>Tenn.</td><td>2,880</td><td>10</td><td>341</td><td>0.5</td><td>17</td><td>0</td><td>0</td><td>0.1</td><td>4</td><td>0</td><td>0</td><td>-</td><td>-</td></tr>
<tr><td>Ala.</td><td>3,520</td><td>10</td><td>407</td><td>-</td><td>-</td><td>t</td><td>+</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0.5</td><td>20</td></tr>
<tr><td>Miss.</td><td>1,110</td><td>5</td><td>66</td><td>-</td><td>-</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0</td><td>0.5</td><td>7</td></tr>
<tr><td>La.</td><td>1,638</td><td>15</td><td>308</td><td>t</td><td>+</td><td>0</td><td>0</td><td>1</td><td>20</td><td>0</td><td>0</td><td>0</td><td>0</td></tr>
<tr><td>Texas</td><td>1,925</td><td>1</td><td>21</td><td>-</td><td>-</td><td>0</td><td>0</td><td>1</td><td>22</td><td>-</td><td>-</td><td>3</td><td>64</td></tr>
<tr><td>Okla.</td><td>2,772</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0</td><td>0</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Ark.</td><td>1,947</td><td>10</td><td>237</td><td>-</td><td>-</td><td>0</td><td>0</td><td>0</td><td>0</td><td>t</td><td>+</td><td>2</td><td>48</td></tr>
<tr><td>Mont.</td><td>3,960</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0</td><td>0</td><td>0</td><td>0</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Wyo.</td><td>1,710</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0</td><td>0</td><td>0</td><td>0</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Colo.</td><td>13,530</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0</td><td>0</td><td>t</td><td>+</td><td>t</td><td>+</td><td>-</td><td>-</td></tr>
<tr><td>N. Mex.</td><td>150</td><td>-</td><td>-</td><td>2</td><td>4</td><td>0</td><td>0</td><td>t</td><td>+</td><td>-</td><td>-</td><td>10</td><td>19</td></tr>
<tr><td>Ariz.</td><td>240</td><td>-</td><td>-</td><td>-</td><td>-</td><td>0</td><td>0</td><td>1</td><td>2</td><td>-</td><td>-</td><td>5</td><td>13</td></tr>
<tr><td>Utah</td><td>2,688</td><td>10</td><td>349</td><td>-</td><td>-</td><td>0</td><td>0</td><td>2.5</td><td>87</td><td>1.5</td><td>52</td><td>[illegible]</td><td>140</td></tr>
<tr><td>Nev.</td><td>870</td><td>8</td><td>84</td><td>-</td><td>-</td><td>0</td><td>0</td><td>6</td><td>63</td><td>-</td><td>-</td><td>3</td><td>31</td></tr>
<tr><td>Idaho</td><td>11,725</td><td>10</td><td>1,536</td><td>3</td><td>461</td><td>0</td><td>0</td><td>5</td><td>768</td><td>0.5</td><td>77</td><td>2</td><td>307</td></tr>
<tr><td>Wash.</td><td>8,060</td><td>10</td><td>959</td><td>2</td><td>192</td><td>t</td><td>+</td><td>2</td><td>192</td><td>t</td><td>+</td><td>t</td><td>+</td></tr>
<tr><td>Oregon</td><td>4,180</td><td>-</td><td>-</td><td>-</td><td>-</td><td>t</td><td>+</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td><td>-</td></tr>
<tr><td>Calif.</td><td>9,880</td><td>12</td><td>1,624</td><td>-</td><td>-</td><td>t</td><td>+</td><td>6</td><td>812</td><td>-</td><td>-</td><td>1</td><td>135</td></tr>
<tr><td>U. S.</td><td>414,472</td><td>3.4</td><td>17,020</td><td>2.8</td><td>13,674</td><td>.1</td><td>623</td><td>2.6</td><td>12,976</td><td>.5</td><td>2,698</td><td>.8</td><td>3,851</td></tr>
</table>

POTATO (continued)

Estimated reduction in yield of potato due to tipburn and hopperburn, early blight (Alternaria solani), and other diseases, 1923.

State	Production: 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease: Tipburn and hopperburn %	Bushels (000 omitted)	Early blight %	Bushels (000 omitted)	Other diseases %	Bushels (000 omitted)	Sum of traces and no data %	Bushels (000 omitted)	All diseases %	Bushels (000 omitted)
Me.	31,992	-	-	-	-	-	-	-	-	-	-
N. H.	2,405	-	-	t	+	-	-	1	29	18	527
Vt.	4,320	-	-	0.5	25	-	-	1	49	13.5	674
Mass.	4,550	-	-	-	-	-	-	1	55	16.5	899
R. I.	330	-	-	-	-	-	-	-	-	5	17
Conn.	3,565	-	-	t	+	10	412	1	41	13.5	556
N. Y.	39,729	5	2,759	0	0	5	2,759	0	0	28	15,450
N. J.	7,600	-	-	t	+	-	-	5	455	16.5	1,501
Pa.	26,145	3	1,053	t	+	3	1,053	0	0	25.5	8,948
Del.	800	1	9	0.5	4	1.5	13	2	17	8	69
Md.	3,920	1.5	71	0.5	23	2	94	1	47	17	802
Va.	14,136	1	163	1	163	1	164	0	0	13.5	2,206
W. Va.	5,880	10	708	t	+	1	71	6	425	17	1,204
N. C.	3,956	4	253	5	316	5	316	0	0	37.5	2,373
S. C.	3,136	t	+	10	392	3	118	7	274	20	784
Ga.	1,540	-	-	1	16	-	-	-	-	6	98
Fla.	1,748	-	-	1	20	2	39	1	20	11.5	227
Ohio	12,348	6	950	t	+	1	158	1	158	22	3,482
Ind.	7,875	2	177	t	+	-	-	3	265	11	973
Ill.	9,568	0.5	50	1.5	149	t	+	2	199	4	398
Mich.	35,796	t	+	t	+	2	842	1	421	15	6,316
Wis.	26,112	2	561	t	+	1	281	1	281	7	1,965
Minn.	38,304	5	2,177	t	+	1	435	1	435	12	5,223

State	Production: 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease: Tipburn and hopperburn %	Bushels (000 omitted)	Early blight %	Bushels (000 omitted)	Other diseases %	Bushels (000 omitted)	Sum of traces and no data %	Bushels (000 omitted)	All diseases %	Bushels (000 omitted)
Iowa	6,804	12	1, 361	t	+	15	1,701	3	340	40	4,536
Mo.	9,300	-	-	t	+	-	-	-	-	5	489
N. Dak.	13,114	t	+	t	+	5	762	1	152	14	2,134
S. Dak.	7,744	3	245	t	+	-	-	1	81	5	407
Nebr.	8,880	-	-	-	-	-	-	10	1,009	12	1,210
Kans.	5,160	2	127	t	+	0.5	32	1	63	18.6	1,179
Ky.	4,930	2	159	2	159	-	-	2	159	38	3,021
Tenn.	2,880	2	68	0.5	17	0.5	17	2	68	15.6	532
Ala.	3,520	-	-	t	+	2	81	1	41	13.5	549
Miss.	1,110	-	-	-	-	10	133	1	13	16.5	219
La.	1,638	1	20	1	20	-	-	2	41	20	409
Texas	1,925	1	21	1	21	3	64	0	0	10	213
Okla.	2,772	t	+	-	-	-	-	8	241	8	241
Ark.	1,947	3	71	2	43	0	0	1	23	18	427
Mont.	3,960	-	-	-	-	-	-	-	-	-	-
Wyo.	1,710	-	-	-	-	-	-	-	-	-	-
Colo.	13,530	t	+	t	+	-	-	-	-	t	+
N. Mex.	150	10	19	-	-	-	-	-	-	22	42
Ariz.	240	-	-	t	+	-	-	-	-	6	15
Utah	2,688	4	140	1	34	-	-	-	-	23	802
Nev.	870	-	-	-	-	-	-	-	-	17	178
Idaho	11,725	-	-	0.2	31	3	461	0	0	23.7	3,641
Wash.	8,060	t	+	0	0	2	192	t	+	16	1,535
Oregon	4,180	-	-	-	-	-	-	-	-	t	+
Calif.	9,880	-	-	-	-	8	1,083	-	-	27	3,654
U. S.	414,472	2.3	11,162	.3	1,438	2.3	11,281	1.1	5,402	16.20	80,125

SWEET POTATO

Estimated reduction in yield of sweet potato due to stem rot (Fusarium hyperoxysporum and F. batatatis), foot rot (Plenodomus destruens), and black rot (Sphaeronema fimbriatum), 1923.

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease					
		Stem rot		Foot rot		Black rot	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
N. J.	2,196	30	1,080	-	-	2	72
Pa.	260	-	-	-	-	-	-
Del.	1,008	8	92	0	0	0.5	5
Md.	1,170	4	56	-	-	1	13
Va.	5,280	5	318	t	+	3	191
W. Va.	390	-	-	0	0	-	-
N. C.	10,500	1	120	2	241	3	362
S. C.	9,118	-	-	-	-	5	501
Ga.	11,508	t	+	0	0	1	142
Fla.	2,940	t	+	-	-	t	+
Ohio	336	t	+	-	-	-	-
Ind.	354	1	3	0	0	1	3
Ill.	880	t	+	0	0	0.5	4
Iowa	280	7	24	-	-	9	31
Mo.	1,512	5	80	-	-	t	+
Kans.	321	15	59	t	+	1.5	6
Ky.	2,060	t	+	0	0	15	686
Tenn.	3,850	0.5	21	0	0	3	129
Ala.	11,752	1	136	-	-	2	274
Miss.	9,898	t	+	2	235	2	235
La.	7,020	t	+	0	0	1	88
Texas	6,880	-	-	0	0	10	1,027
Okla.	2,700	-	-	-	-	-	-
Ark.	3,800	2	172	0	0	2	172
N. Mex.	134	-	-	-	-	2	2
Ariz.	340	-	-	-	-	-	-
Calif.	690	-	-	-	-	-	-
U. S.	97,177	1.8	2,167	0.4	476	3.2	3,943

SWEET POTATO (continued)

Estimated reduction in yield of sweet potato due to storage rots, pox (*Cystospora batata*), and other diseases, 1923.

State	Estimated reduction in yield due to disease									
	Storage rots		Pox		Other diseases		Sum of traces and no data		All diseases	
	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
N. J.	-	-	5	180	2	72	0	0	39	1,404
Pa.	-	-	-	-	-	-	-	-	-	-
Del.	1	11	0.5	5	1.5	17	0	0	11.5	130
Md.	-	-	0.5	7	-	-	10	138	15.5	214
Va.	8	509	1	63	t	+	0	0	17	1,081
W. Va.	-	-	-	-	-	-	-	-	-	-
N. C.	5	604	-	-	2	241	0	0	13	1,568
S. C.	2	200	-	-	1	100	1	100	9	901
Ga.	10	1,421	-	-	-	-	8	1,136	19	2,699
Fla.	1	29	-	-	-	-	-	-	1	29
Ohio	-	-	0	0	-	-	2	6	2	6
Ind.	1	4	0	0	0	0	0	0	3	10
Ill.	0	0	0	0	0	0	0	0	0.5	4
Iowa	-	-	-	-	-	-	3	10	19	65
Mo.	-	-	-	-	-	-	8	139	13	225
Kans.	3	12	t	+	t	+	0	0	19.5	77
Ky.	40	1,831	-	-	-	-	0	0	55	2,517
Tenn.	5	216	-	-	0.5	21	1.5	64	10.5	451
Ala.	10	1,367	-	-	1	136	0	0	14	1,913
Miss.	10	1,179	-	-	2	236	0	0	16	1,885
La.	15	1,316	t	+	4	351	0	0	20	1,755
Texas	20	2,054	1	102	2	205	0	0	33	3,388
Okla.	-	-	-	-	-	-	15	476	15	476
Ark.	25	2,160	2	172	25	2,160	0	0	56	4,836
N. Mex.	-	-	-	-	-	-	-	-	2	2
Ariz.	-	-	-	-	-	-	-	-	-	-
Calif.	-	-	-	-	-	-	-	-	-	-
U. S.	10.5	12,913	0.4	529	2.9	3,539	1.7	2,069	20.9	25,636

TOMATO

Estimated percentage reduction in yield of tomatoes due to blight, (*Septoria lycopersici*), fusarium wilt (*Fusarium lycopersici*), bacterial wilt (*Bacillus solanacearum*), early blight (*Alternaria solani*), and other diseases, 1923. (Production figures not available.)

State	Estimated percentage reduction in yield due to disease						
	Blight	Fusarium wilt	Bacterial wilt	Early blight	Other diseases	Sum of traces & no data	All diseases
Me.	t	-	0	-	-	-	+
N. H.	t	-	0	-	-	1	1
Vt.	0.5	-	0	0.5	-	0	1
Mass.	t	-	0	t	-	1	1
R. I.	t	-	0	-	-	-	+
Conn.	t	-	0	-	6	2	8
N. Y.	0.5	t	0	5	-	6	11.5
N. J.	-	3	0	t	5	2	10
Pa.	-	t	0	2	6	2	10
Del.	25	1	-	t	1	0	27
Md.	15	5	-	-	-	2	22
Va.	20	2	t	2	5	0	29
W. Va.	10	t	t	10	3	1	24
N. C.	3	5	3	3	15	0	29
S. C.	30	t	-	-	10	2	42
Fla.	t	t	-	-	-	-	+
Ohio	t	12	0	t	5	1	18
Ind.	6	4	0	0.1	1.1	0	11.2
Ill.	0.5	12	0	4	1	0	17.5
Mich.	10	t	0	0	1	0	11
Wis.	1	t	0	t	1	1	3
Minn.	1	t	0	t	1	1	3
Iowa	t	4	0	t	1	1	6
Mo.	t	-	-	t	5	1	6
N. Dak.	t	t	0	t	-	2	2
S. Dak.	-	-	0	-	1	1	2
Kans.	1	5	0	-	2	1	9
Ky.	12	5	0	t	20	0	37
Tenn.	5	5	-	1	3	2	16
Ala.	10	8	-	1	8	0	27
Miss.	0	10	t	5	12	0	27
La.	t	20	5	5	5	0	35
Texas	4	4	-	1	3	0	12
Okla.	-	-	-	t	-	-	+
Ark.	1	25	0	-	1	0	27
Colo.	t	0	0	0	-	2	2
N. Mex.	3	5	0	-	2	0	10
Utah	-	2	0	-	-	-	2
Nev.	-	-	0	-	15	0	15
Idaho	-	-	0	-	12	0	12
Wash.	0	0	0	0	10	0	10

COTTON

Estimated reduction in yield of cotton due to anthracnose (Colletotrichum gossypii), angular leaf spot (Bacterium malvacearum), wilt (Fusarium vasinfectum), root knot (Heterodera radicicola), and other diseases, 1923.

State	Production 1923 Bales (000 omitted)	Estimated reduction in yield due to disease: Anthracnose %	Anthracnose Bales (000 omitted)	Angular leaf spot %	Angular leaf spot Bales (000 omitted)	Wilt %	Wilt Bales (000 omitted)	Root knot %	Root knot Bales (000 omitted)	Other diseases %	Other diseases Bales (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bales (000 omitted)	All diseases %	All diseases Bales (000 omitted)
Va.	50	1	1	t	+	1	+	t	+	1	1	1	+	4	2
N. C.	1,020	3	36	1	12	3	36	2	23	5	59	0	0	14	166
S. C.	795	1	9	5	46	2	18	-	-	4	36	1	9	13	118
Ga.	590	1	7	2	14	3	20	-	-	-	-	8	55	14	96
Fla.	12	1	+	2	+	3	+	-	-	-	-	6	1	12	1
Mo.	115	-	-	*-	+	-	-	-	-	-	-	-	-	-	-
Tenn.	220	5	12	2	5	1	2	t	+	2	5	0	0	10	24
Ala.	600	5	33	1	7	3	20	t	+	1	7	0	0	10	67
Miss.	615	4	28	t	+	3	21	t	+	5	35	1	7	13	91
La.	365	7	30	1	4	2	8	-	-	2	8	1	4	13	54
Texas	4,290	1	59	8	470	2	117	1	59	15	882	0	0	27	1,587
Okla.	620	1	7	5	36	3	21	-	-	-	-	4	29	13	93
Ark.	620	1	7	5	38	5	38	2	15	5	38	0	0	18	136
Ariz.	83	0	0	*-	-	-	-	-	-	-	-	5	4	5	4
Calif.	49	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Other states	37	-	-	-	-	-	-	-	-	-	-	-	-	-	-
U. S.	10,081	1.8	229	5.0	632	2.4	301	0.8	97	8.6	1,071	0.9	109	19.5	2,439

DRY BEAN

Estimated reduction in yield of dry beans due to anthracnose (*Colletotrichum lindemuthianum*), bacterial blight (*Bacterium phaseoli*), mosaic, root rots (*Fusarium spp.*), and other diseases, 1923.

State	Production: 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease													
		Anthracnose		Bacterial blight		Mosaic		Root rots		Other diseases		Sum of traces and no data		All diseases	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (600 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
N. Y.	1,690	t	+	6	122	3	61	7	143	1	20	0	0	17	346
Mich.	6,532	5	384	10	768	t	+	-	-	t	+	0	0	15	1,152
Wis.	90	t	+	1	1	t	+	t	+	t	+	1	1	2	2
Colo.	1,360	t	+	t	+	-	-	-	-	-	-	-	-	t	+
N. Mex.	345	2	8	1	4	t	+	1	4	10	40	0	0	14	56
Ariz.	39	0	0	-	-	-	-	-	-	-	-	-	-	-	-
Idaho	990	-	-	-	-	5	53	-	-	1	10	-	-	6	63
Calif.	4,694	0	0	-	-	-	-	-	-	3	145	-	-	3	145
U. S.	15,740	2.2	392	5.1	895	0.7	114	0.8	147	1.2	215	t	1	10	1,764

BEAN

Estimated reduction in yield of beans due to anthracnose (Colletotrichum lindemuthianum), bacterial blight (Bacterium phaseoli), mosaic, root rots (Fusarium spp.), and other diseases, 1923, in states other than those for which production figures are available. (See page 337)

State	Estimated reduction in yield due to disease						
	Anthrac-nose	Bacterial blight	Mosaic	Root rots	Other diseases	Sum of traces & no data	All diseases
	%	%	%	%	%	%	%
N. H.	t	-	-	-	-	4	4
Vt.	2	1	1	-	-	1	5
Mass.	2	t	t	2	-	1	5
R. I.	-	-	t	-	-	5	5
Conn.	0.5	-	0.5	-	-	4	5
N. J.	-	-	-	-	-	8	8
Pa.	2	4	1	2	t	0	9
Del.	1	0.5	-	-	0.5	1	3
Md.	1	1.5	t	t	-	1	3.5
Va.	2	8	t	7	1	0	18
W. Va.	4	t	t	t	1	1	6
N. C.	-	-	-	-	-	5	5
S. C.	-	2	-	2	3	0	7
Fla.	t	-	t	-	2	3	5
Ohio	3	1	-	-	-	2	6
Ind.	1	-	4	t	-	1	6
Ill.	0	t	0	0	t	1	1
Minn.	t	1	1	t	t	1	3
Iowa	t	-	5	-	-	1	6
Mo.	t	-	-	-	-	4	4
N. Dak.	t	-	-	-	-	t	t
S. Dak.	t	-	-	-	-	t	t
Ky.	15	5	-	10	-	0	30
Tenn.	2	1	1	1.5	0.5	-	6
Ala.	4	3	t	-	1	0	8
Miss.	2	-	2	0.5	2	0	6.5
La.	1	3	1	5	2	0	12
Texas	0	1	t	2	6	0	9
Okla.	0	-	t	-	-	3	3
Ark.	2	0	2	0	0	0	4
Utah	-	-	3	-	-	-	3
Wash.	0	0	2	t	2	0	4

APPLE

Estimated reduction in yield of apple due to bitter rot (*Glomerella cingulata*), black rot (*Physalospora cydoniae*), blotch (*Phyllosticta solitaria*), and cedar rust (*Gymnosporangium*), 1923.

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease							
		Bitter rot		Black rot		Blotch		Cedar rust	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	2,300	0	0	-	-	0	0	-	-
N. H.	800	0	0	t	+	0	0	t	+
Vt.	592	0	0	1	6	0	0	-	-
Mass.	3,015	t	+	0.5	16	0	0	t	+
R. I.	450	-	-	0.5	2	0	0	t	+
Conn.	1,700	-	-	1	18	0	0	0.5	9
N. Y.	24,000	t	+	1	289	0	0	1	289
N. J.	2,203	0.5	12	0.5	12	0.5	12	t	+
Pa.	10,855	t	+	t	+	0.5	60	t	+
Del.	1,200	1.5	24	1	16	t	+	t	+
Md.	2,300	1	27	5	139	1	28	0.5	14
Va.	9,800	0.5	61	1	122	0.5	62	2	245
W. Va.	8,320	0.5	50	2	202	1	101	2	202
N. C.	2,700	5	193	5	193	3	116	2	77
S. C.	274	5	16	3	10	1	3	1	3
Ga.	864	5	48	-	-	0.5	5	0.5	5
Ohio	12,395	1	159	5	798	5	798	0.3	48
Ind.	5,035	1	56	2	112	2	112	t	+
Ill.	7,370	1	87	1	86	5.5	477	1	87
Mich.	13,159	0	0	t	+	0	0	0	0
Wis.	2,340	0	0	0	0	0	0	t	+
Minn.	1,520	0	0	t	+	0	0	0.5	9
Iowa	3,750	-	-	3	139	3	139	3	139
Mo.	7,072	4	323	-	-	3	243	-	-
S. Dak.	212	0	0	-	-	0	0	-	-
Nebr.	880	0	0	-	-	-	-	-	-
Kans.	2,166	t	+	t	+	12	321	0.5	13
Ky.	2,625	8	447	t	+	-	-	-	-
Tenn.	1,311	15	293	1	19	10	196	1	20
Ala.	731	1	8	1.5	13	10	89	t	+
Miss.	120	3	4	3	4	3	4	t	+
La.	31	t	+	t	+	t	+	t	+
Texas	270	1	3	1	3	4	12	-	-
Okla.	1,240	t	+	-	-	6	80	-	-
Ark.	3,025	1	35	0.3	11	3	105	1	35
Mont.	990	0	0	-	-	0	0	0	0
Wyo.	35	0	0	-	-	0	0	0	0
Colo.	3,010	0	0	-	-	0	0	0	0
N. Mex.	1,400	0	0	-	-	0	0	0	0
Ariz.	128	0	0	0	0	0	0	0	0
Utah	1,119	0	0	0	0	0	0	0	0
Nev.	56	0	0	0	0	0	0	0	0
Idaho	5,600	0	0	0	0	0	0	0	0
Wash.	31,357	0	0	0	0	0	0	0	0
Oregon	8,000	0	0	-	-	0	0	0	0
Calif.	8,450	0	0	-	-	0	0	0	0
U. S.	196,770	0.81	1,846	0.97	2,210	1.31	2,963	0.53	1,195

Estimated reduction in yield of apple due to fire blight (Bacillus amylovorus), scab (Venturia inaequalis), and other diseases, 1923

State	Estimated reduction in yield due to disease									
	Fire blight		Scab		Other diseases		Sum of traces and no data		All diseases	
	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	-	-	-	-	-	-	-	-	-	-
N. H.	t	+	1	8	-	-	1	8	2	16
Vt.	2	13	5	33	-	-	1	6	9	58
Mass.	0.5	15	1	31	2	63	0	0	4	125
R. I.	0.5	2	2	10	2	10	1	4	6	28
Conn.	0.5	9	3	54	1	18	0	0	6	108
N. Y.	8	2,313	5	1,446	2	578	0	0	17	4,915
N. J.	0.5	12	0.5	12	5.5	131	0	0	8	191
Pa.	3	364	4	485	3	364	-	-	10.5	1,273
Del.	0.5	8	3	49	20	324	0	0	26	421
Md.	5	139	3	84	2	56	0	0	17.5	487
Va.	1	122	3	368	12	1,470	0	0	20	2,450
W. Va.	1	101	1	100	10	1,008	0	0	17.5	1,764
N. C.	4	154	8	309	3	116	0	0	30	1,158
S. C.	1	3	1	3	2	6	0	0	14	44
Ga.	1	9	3	29	-	-	-	-	10	96
Ohio	3	478	6	957	2	319	0	0	22.3	3,557
Ind.	1	56	4	225	0.3	17	0	0	10.3	578
Ill.	1.5	130	3.5	303	1.5	130	0	0	15	1,300
Mich.	5	708	1	141	-	-	1	141	7	990
Wis.	2	49	2	49	1	25	0	0	5	123
Minn.	4	70	3	53	6	105	0	0	13.5	237
Iowa	1	46	7	324	2	92	0	0	19	879
Mo.	0.5	40	-	-	-	-	5	404	12.5	1,010
S. Dak.	-	-	-	-	-	-	-	-	-	-
Nebr.	-	-	-	-	-	-	-	-	-	-
Kans.	3	80	1.5	40	2	54	0	0	19	508
Ky.	5	279	30	1,676	-	-	10	558	53	2,960
Tenn.	2	39	2	39	2	39	0	0	33	645
Ala.	1	9	4	36	t	+	0	0	17.5	155
Miss.	4	6	t	+	1	1	0	0	14	19
La.	t	+	-	-	1	+	1	+	2	+
Texas	3	9	-	-	5	16	0	0	14	43
Okla.	t	+	-	-	-	-	2	27	8	107
Ark.	3	105	0.5	18	5	175	0	0	13.8	484
Mont.	-	-	-	-	-	-	-	-	-	-
Wyo.	-	-	-	-	-	-	-	-	-	-
Colo.	t	+	-	-	-	-	-	-	t	+
N. Mex.	8	127	-	-	4	63	0	0	12	190
Ariz.	-	-	-	-	-	-	-	-	-	-
Utah	-	-	-	-	-	-	-	-	-	-
Nev.	3	1	-	-	2	1	0	0	5	2
Idaho	5	303	0.5	30	2	121	0	0	7.5	454
Wash.	1	339	0.5	170	6	2,033	0	0	7.5	2,542
Oregon	-	-	-	-	-	-	-	-	-	-
Calif.	-	-	-	-	-	-	-	-	t	+
U. S.	2.71	6,138	3.12	7,082	3.24	7,335	0.51	1,148	13.20	29,917

PEACH

Estimated reduction in yield of peach due to leaf curl (*Exoascus deformans*), brown rot (*Sclerotinia cinerea*), yellows and little peach, scab (*Cladosporium carpophilum*), and other diseases, 1923.

State	Production 1923 Bushels (000 omitted)	Leaf curl %	Leaf curl Bushels (000 omitted)	Brown rot %	Brown rot Bushels (000 omitted)	Yellows and little peach %	Yellows and little peach Bushels (000 omitted)	Scab %	Scab Bushels (000 omitted)	Other diseases %	Other diseases Bushels (000 omitted)	Sum of traces and no data %	Sum of traces and no data Bushels (000 omitted)	All diseases %	All diseases Bushels (000 omitted)
N. H.	40	1	+	-	-	0	0	1	+	-	-	1	1	3	1
Mass.	205	1	2	0.5	1	t	+	t	+	1	2	0	0	2.5	5
R. I.	31	-	-	-	-	t	+	-	-	-	-	-	-	t	+
Conn.	232	-	-	2	5	t	+	0.5	1	0.5	1	0	0	3	7
N. Y.	1,700	8	158	3	59	1	19	1	20	-	-	1	20	14	276
N. J.	2,642	t	+	t	+	0.5	13	0.5	14	3	83	0	0	4	110
Pa.	1,907	2	41	3	62	1	20	1	21	1	21	0	0	8	165
Del.	225	1	2	1	3	0.5	1	2	5	10	27	0	0	14.5	38
Md.	631	3	19	-	-	-	-	-	-	-	-	-	-	3	19
Va.	504	0.5	2	2	11	t	+	1	5	-	-	2	11	5.5	29
W. Va.	526	t	+	5	28	t	+	t	+	-	-	2	11	7	39
N. C.	260	2	6	9	27	-	-	3	9	1	3	0	0	15	45
S. C.	550	1	9	30	280	-	-	-	-	10	93	0	0	41	382
Ga.	5,248	1	55	5	279	0	0	-	-	-	-	-	-	6	334
Fla.	120	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Ohio	1,386	2	32	4	63	0.5	8	4	63	2	32	0	0	12.5	198
Ind.	445	0.5	2	1.5	7	-	-	-	-	3.5	16	0	0	5.5	25
Ill.	675	3	22	2	14	-	-	0.5	4	2.5	18	0	0	8	58
Mich.	1,125	t	+	t	+	2	23	t	+	-	-	1	11	3	34
Iowa	40	4	2	-	-	0	0	-	-	-	-	1	+	5	2

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease: Leaf curl %	Bushels (000 omitted)	Brown rot %	Bushels (000 omitted)	Yellows and little peach %	Bushels (000 omitted)	Scab %	Bushels (000 omitted)	Other diseases %	Bushels (000 omitted)	Sum of traces and no data %	Bushels (000 omitted)	All diseases %	Bushels (000 omitted)
Mo.	1,040	-	-	-	-	0	0	-	-	-	-	2	21	2	21
Nebr.	45	-	-	-	-	0	0	-	-	0	0	-	-	-	-
Kans.	78	0	0	0	0	0	0	0	0	0	0	-	-	-	-
Ky.	450	20	141	10	70	t	+	3	21	-	-	3	21	36	253
Tenn.	460	3	17	10	55	-	-	2	11	2	11	0	0	17	94
Ala.	779	t	+	10	90	0	0	2	18	2	18	0	0	14	126
Miss.	260	t	+	3	9	0	0	1	2	5	14	0	0	9	25
La.	175	t	+	20	46	0	0	1	2	4	10	0	0	25	58
Texas	1,700	t	+	5	96	0	0	2	38	4	76	0	0	11	210
Okla.	1,290	t	+	3	42	0	0	-	-	-	-	4	55	7	97
Ark.	1,110	2	25	5	63	0	0	3	38	2	25	0	0	12	151
Colo.	792	-	-	-	-	0	0	-	-	-	-	-	-	-	-
N. Mex.	189	-	-	2	3	0	0	-	-	-	-	-	-	2	3
Ariz.	90	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Utah	802	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Nev.	5	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Idaho	282	t	+	-	-	0	0	-	-	1	2	-	-	1	2
Wash.	1,333	t	+	1	14	0	0	-	-	5	71	0	0	6	85
Oregon	500	-	-	-	-	0	0	-	-	-	-	-	-	-	-
Calif.	15,830	0.2	31	-	-	0	0	-	-	-	-	-	-	0.2	31
U. S.	45,702	1.2	566	2.7	1,327	0.2	84	0.5	272	1.1	523	0.3	151	6.0	2,923

PEAR

Estimated reduction in yield of pear due to fire blight (Bacillus amylovorus), scab (Venturia pyrina), leaf blight (Fabraea maculata), and other diseases, 1923.

State	Production: 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease											
		Fire blight		Scab		Leaf blight		Other diseases		Sum of traces and no data		All diseases	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Me.	7	-	-	-	-	-	-	-	-	-	-	-	-
N. H.	12	t	+	t	+	-	-	-	-	1	+	1	+
Vt.	6	1	+	1	+	-	-	-	-	0	0	2	+
Mass.	58	0.5	+	0.5	+	-	-	t	+	0	0	1	+
R. I.	10	-	-	0.5	+	-	-	-	-	0.5	+	1	+
Conn.	37	0.5	+	1	+	0.5	+	-	-	0	0	2	+
N. Y.	1,000	15	208	3	42	t	+	10	138	0	0	28	388
N. J.	662	5	37	t	+	2	14	3	22	-	-	10	73
Pa.	612	1	6	1	6	t	+	2	13	-	-	4	25
Del.	370	1	4	-	-	5	22	10	44	0	0	16	70
Md.	374	8	35	1	4	5	21	-	-	0	0	14	60
Va.	200	2	4	-	-	t	+	-	-	1	2	3	6
W. Va.	41	4	2	t	+	t	+	t	+	1	+	5	2
N. C.	65	20	16	-	-	-	-	-	-	1	1	21	17
S. C.	88	50	92	-	-	-	-	2	3	0	0	52	95
Ga.	192	10	21	-	-	-	-	-	-	-	-	10	21
Fla.	35	-	-	-	-	-	-	-	-	-	-	-	-
Ohio	332	5	19	2	8	t	+	7	27	0	0	14	54
Ind.	334	-	-	-	-	t	+	-	-	4	13	4	13
Ill.	307	6	20	t	+	t	+	1	3	0	0	7	23
Mich.	900	t	+	t	+	t	+	-	-	1	9	1	9
Wis.	16	1	+	t	+	t	+	t	+	1	+	2	+
Iowa	62	-	-	-	-	-	-	-	-	-	-	-	-

State	Production 1923 Bushels (000 omitted)	Estimated reduction in yield due to disease											
		Fire blight		Scab		Leaf blight		Other diseases		Sum of traces and no data		All diseases	
		%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)	%	Bushels (000 omitted)
Nebr.	24	-	-	-	-	-	-	-	-	-	-	-	-
Mo.	475	-	-	-	-	-	-	-	-	-	-	-	-
Kans.	134	2	3	-	-	-	-	-	-	-	-	2	3
Ky.	70	50	70	t	+	t	+	-	-	0	0	50	70
Tenn.	83	30	36	-	-	t	+	-	-	1	1	31	37
Ala.	174	20	45	t	+	t	+	3	6	0	0	23	51
Miss.	90	40	65	-	-	-	-	5	8	0	0	45	73
La.	45	50	46	-	-	-	-	2	2	0	0	52	48
Texas	340	5	19	-	-	-	-	8	31	0	0	13	50
Okla.	100	-	-	-	-	-	-	-	-	-	-	-	-
Ark.	45	50	45	-	-	-	-	-	-	-	-	50	45
Mont.	8	-	-	-	-	-	-	-	-	-	-	-	-
Colo.	400	t	+	-	-	-	-	-	-	-	-	t	+
N. Mex.	49	15	9	-	-	-	-	2	1	0	0	17	10
Ariz.	18	-	-	-	-	-	-	-	-	-	-	-	-
Utah	64	t	+	-	-	-	-	-	-	-	-	t	+
Nev.	7	1	+	-	-	-	-	-	-	-	-	1	+
Idaho	72	5	3	-	-	-	-	-	-	-	-	5	3
Wash.	2,600	0.5	14	t	+	0	0	5	137	0	0	5.5	151
Oregon	1,540	-	-	-	-	-	-	-	-	-	-	-	-
Calif.	5,332	-	-	-	-	-	-	-	-	-	-	-	-
U. S.	17,390	4.35	819	0.32	60	0.30	57	2.31	435	0.14	26	7.42	1,397

PLUM AND PRUNE

Estimated reduction in yield of plum and prune due to brown rot (*Sclerotinia cinerea*), and other diseases, 1923.

State	Estimated reduction in yield due to disease			
	Brown rot	Other diseases	Sum of traces and no data	All diseases
	%	%	%	%
N. H.	1	-	0	1
Vt.	2	-	0	2
Mass.	0.5	1	0	1.5
Conn.	1	1	0	2
N. Y.	2	1.5	0	3.5
N. J.	0.5	1.5	-	2
Pa.	1.5	1	-	2.5
Del.	0.5	0.5	0	1
Md.	-	-	1	1
Va.	2	-	0	2
W. Va.	4	2	0	6
N. C.	-	-	3	3
S. C.	1	2	0	3
Ohio	11	2	0	13
Ind.	-	-	4	4
Ill.	5	2	0	7
Mich.	t	-	0	+
Wis.	5	-	0	5
Minn.	3.5	7	0	10.5
Iowa	22	-	-	22
N. Dak.	1	5	0	6
Ky.	10	-	10	20
Tenn.	20	1	0	21
Miss.	-	1	0	1
La.	t	-	-	+
Texas	-	2	0	2
Okla.	-	-	2	2
Ark.	10	5	0	15
N. Mex.	2	-	0	2
Idaho	-	1	1	2
Wash.	1	3	4	8

CHERRY

Estimated reduction in yield of cherries due to brown rot (*Sclerotinia cinerea*), leaf spot (*Coccomyces hiemalis*), and other diseases, 1923.

State	Estimated reduction in yield due to disease				
	Brown rot	Leaf spot	Other diseases	Sum of traces and no data	All diseases
	%	%	%	%	%
N. H.	1	-	-	-	1
Mass.	0.5	0.5	-	0	1
Conn.	1	-	1	0	2
N. Y.	2	0.5	0.5	0	3
N. J.	t	1	0.5	-	1.5
Pa.	2	0.3	0.7	-	3
Del.	0.5	0.2	5	0	5.7
Va.	2	3	-	0	5
W. Va.	2	t	t	0	2
Ohio	1	8	1	0	10
Ind.	1	5	-	0	6
Ill.	2	1.5	t	0	3.5
Mich.	t	2	0	0	2
Wis.	t	1	1	0	2
Iowa	3	4	-	-	7
Kans.	2	4	-	0	6
Ky.	5	20	3	0	28
Tenn.	1	5	1	0	7
Ark.	3	4	2	0	9
N. Mex.	2	-	-	0	2
Idaho	0	-	1	0	1
Wash.	3	t	2	0	5

GRAPE

Estimated reduction in yield of grape due to black rot (Guignardia bidwellii), and other diseases, 1923.

State	Estimated reduction in yield due to disease			
	Black rot	Other diseases	Sum of traces and no data	All diseases
	%	%	%	%
N. H.	t	-	0	+
Vt.	-	-	t	+
Mass.	t	t	0	+
R. I.	t	-	0	+
Conn.	0.5	0.5	0	1
N. Y.	t	1	0	1
N. J.	-	-	1	1
Pa.	t	t	1	1
Del.	4	2	0	6
Md.	4	4	0	8
Va.	5	2	0	7
W. Va.	10	t	0	10
N. C.	10	2	0	12
S. C.	15	2	0	17
Ohio	7	2	0	9
Ind.	3	-	0	3
Ill.	3.5	2.5	0	6
Wis.	1	t	0	1
Minn.	1	5	0	6
Iowa	4	2	0	6
Kans.	2	2	0	4
Ky.	-	20	-	20
Tenn.	5	10	0	15
Ala.	8	1	0	9
Miss.	5	5	0	10
La.	t	-	t	+
Texas	10	10	0	20
Ark.	2	1	0	3
N. Mex.	1	2	3	6
Utah	-	5	5	10
Wash.	0	2	0	2

RASPBERRY

Estimated reduction in yield of raspberries due to mosaic and leaf curl (cause unknown), and other diseases, 1923.

State	Estimated reduction in yield due to disease			
	Mosaic and Leaf curl	Other diseases	Sum of traces and no data	All diseases
	%	%	%	%
Vt.	1	-	0	1
Mass.	10	1	0	11
Conn.	4	1	0	5
N. Y.	20	5	0	25
N. J.	15	5	-	20
Pa.	15	15	0	30
Del.	1	0.5	0	1.5
Md.	2	-	-	2
Va.	-	5	0	5
W. Va.	-	2	0	2
Ohio	3	18	0	21
Ind.	3	10	0	13
Ill.	t	6	0	6
Mich.	10	10	0	20
Wis.	1	5	0	6
Minn.	4.5	6	0	10.5
Iowa	-	16	-	16
N. Dak.	t	2	0	2
Kans.	-	10	0	10
Ky.	-	-	55	55
Tenn.	t	5	0	5
Miss.	-	t	0	+
Texas	-	10	0	10
Ark.	0	7	0	7
N. Mex.	-	1	0	1
Utah	20	-	0	20
Idaho	2	2	0	4
Wash.	5	10	0	15

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THE PLANT DISEASE REPORTER

Issued By

The Plant Disease Survey

Supplement 37

Diseases of Forest and Shade Trees, Ornamental and Miscellaneous Plants in the United States in 1923

March 30, 1925

BUREAU OF PLANT INDUSTRY

UNITED STATES DEPARTMENT OF AGRICULTURE

PLANT DISEASE SURVEY

1923

List of collaborators of the Plant Disease Survey who have made the principal contribution to the 1923 annual summary.

It should be understood that many other collaborators and pathologists have assisted in gathering data within the States but the following list includes those who actually furnished state reports to the Washington office.

Alabama	L. E. Miles
	W. A. Gardner
Arizona	J. G. Brown
	D. C. George
Arkansas	J. A. Elliott
California	J. T. Barrett
	W. T. Horne
	W. S. Fields
Colorado	C. D. Learn
	Ellsworth Bethel
Connecticut	G. P. Clinton
	E. M. Stoddard
Delaware	J. F. Adams
Florida	O. F. Burger
	G. F. Weber
Georgia	T. H. McHatton
Idaho	C. W. Hungerford
	Henry Schmitz
Illinois	H. W. Anderson
	L. R. Tehon
Indiana	M. W. Gardner
Iowa	I. E. Melhus
	H. S. Conard
Kansas	L. E. Melchers
	R. F. White
	E. A. Stokdyk
Kentucky	W. D. Valleau
Louisiana	C. W. Edgerton
Maine	W. J. Morse
Maryland	C. E. Temple
	R. A. Jehle
Massachusetts	A. V. Osmun
	W. H. Davis
	P. J. Anderson
Michigan	G. H. Coons
Minnesota	Sect. Pl. Path.
Mississippi	D. C. Neal
	H. D. Barker
Missouri	A. C. Burrill
	W. E. Maneval
Montana	H. M. Jennison
	D. B. Swingle
	W. N. Christopher
Nebraska	R. W. Goss
Nevada	C. W. Lantz
New Hampshire	O. Butler
New Jersey	Sect. Pl. Path.
New Mexico	R. F. Crawford
New York	Charles Chupp
	L. M. Massey
	R. S. Kirby
North Carolina	A. C. Foster
North Dakota	H. L. Bolley
	Wanda Weinger
Ohio	A. D. Selby
	H. C. Young
	R. C. Thomas
	Freda Detmers
Oklahoma	Robert Stratton
Oregon	H. P. Barss
	S. M. Zeller
	C. E. Owens
Pennsylvania	C. R. Orton
	W. A. McCubbin
	H. W. Thurston
	L. O. Overholtz
Rhode Island	H. W. Browning
	W. A. Snell
South Carolina	C. A. Ludwig
South Dakota	E. J. Petry
	A. T. Evans
Tennessee	L. R. Hesler
Texas	J. J. Taubenhaus
Utah	B. L. Richards
Vermont	B. F. Lutman
Virginia	F. D. Fromme
Washington	F. D. Heald
	B. F. Dana
	Arthur Frank
West Virginia	N. J. Giddings
	E. C. Sherwood
	Anthony Berg
Wisconsin	R. E. Vaughan
Wyoming	Aven Nelson

DISEASES OF FOREST AND SHADE TREES, ORNAMENTAL AND MISCELLANEOUS PLANTS IN THE UNITED STATES IN 1923

Plant Disease Reporter
Supplement 37

March 30, 1925

Prepared by
G. Hamilton Martin

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Foreword

This summary of the diseases of forest and shade trees, ornamental and miscellaneous plants in the United States in 1923 follows the same general plan as those of the preceding years. The sources upon which the information is based are as follows: (1) collaborators, (2) specialists in the Office of Forest Pathology, (3) articles in botanical journals, and (4) special reporters.

Many reports of new occurrences were received for 1923 both for states and for the United States. In the accompanying summary these first occurrences have been noted by symbols before each individual report. New York, Mississippi, Minnesota, Florida and Connecticut contributed the largest number of first reports. Many occurrences are given which have been obtained from literature, from the herbarium of Pathological Collections, or from past records of the Plant Disease Survey. Quite a number of diseases have been omitted due to their unimportance or to the fact that they have been reported in other years. It is not the object of this summary to enumerate all of the diseases that have been reported during the year, but to give facts concerning only some of the more important ones. Owing to the nature of the data it is presented herewith in list form

Where specimens are not indicated the report is based on the authority of the person cited. The date given is that of its earliest reported appearance in 1923. Reports from British Columbia are given on account of the probable occurrence of the disease being also in Washington and Idaho.

The following symbols are used: * indicates a specimen in Pathological Collections; + preceding disease indicates the first report of the disease to the Plant Disease Survey; + preceding state indicates the first report from the state to the Plant Disease Survey.

References have been given and in some instances brief abstracts made of recent articles which may be of service to those who do not have access to all the botanical journals. A list of collaborators is given on the opposite page. The names of the special reporters are as follows:

Boyce, J. S.
Dewey, L. H.
Foster, A. C.
Gravatt, A. E.
Gravatt, A. H.
Gravatt, G. F.
Graves, Arthur
Hahn, G. G.
Harter, L. L.
Haskell, R. J.
Jenkins, Anna E.
Kinskern, E. A.
Martin, J. F.
McCormick, F. A.
McCulloch, L.
Ninman, J. H.
Posey, G. B.
Rhodes, A. L.
Strayer, F. R.
Tisdale, W. B.
Weimer, W. L.
Weir, J. R.
Zappe, M. P.

DISEASES OF CONIFERS

CEDAR, WHITE (Chamaecyparis thyoides)
Rust caused by Gymnosporangium ellisii (Berk.) Farl.
Connecticut - fruiting abundantly on the witches brooms, first report made in 1922, Bethany, New Haven County. (Clinton)
Prior reports: Alabama, Connecticut, *Delaware, Florida, *Massachusetts, *New Jersey, *Pennsylvania and Rhode Island.

CEDAR, CALIFORNIA INCENSE (Libocedrus decurrens)
Rust caused by Gymnosporangium blasdaleanum (D. & H.) Kern
Oregon - locally severe; Rujada, Lane County, June 17. (Boyce)
Prior reports: *Oregon and *California.

CEDAR (Juniperus procumbens and J. sabina)
Phomopsis juniperovora Hahn; Pennsylvania - (A. E. Gravatt)

CEDAR, COLORADO JUNIPER (Juniperus scopulorum)
Rust caused by Gymnosporangium globosum Farl.
+Colorado - (Learn). Prior report: *North Dakota.
+Phomopsis juniperovora Hahn; Illinois - (A. E. Gravatt)

CEDAR, RED (Juniperus virginiana)
Rust caused by Gymnosporangium globosum Farl.
*New York - common in Hudson Valley, May 15. (Chupp)
Iowa - an unusually large amount of sporulation occurred. (Melhus)
Prior reports: Alabama, Connecticut, *Indiana, Iowa, Kansas, *Massachusetts, Minnesota, *Mississippi, *Missouri, New York, North Dakota, Pennsylvania, *South Carolina, West Virginia and Wisconsin.
Rust caused by Gymnosporangium juniperi-virginianae Schw.
Reported from *New York, Connecticut, *New Jersey, South Carolina and Ohio.
Prior reports: *Alabama, Delaware, Georgia, *Indiana, *Iowa, *Kansas, Louisiana, *Maryland, *Massachusetts, Minnesota, Mississippi, *Missouri, Montana, *Nebraska, *New Jersey, North Dakota, Pennsylvania, South Dakota, *Texas, *Virginia, West Virginia and Wisconsin.
Phomopsis juniperovora Hahn; Pennsylvania, Illinois - (A. E. Gravatt)
Prior reports:Illinois, Iowa, Kansas, Minnesota, Nebraska, New York, Ohio, and *Pennsylvania.

CEDAR (Puniperus spp.)
Phomopsis juniperovora Hahn; +Missouri - in a nursery; new for state. (Maneval)

FIR, CASCADE (Abies amabilis)

+Leaf blister rust caused by Calyptospora columnaris (Alb.& Schw.) Kuhn

Oregon - slight injury; Larch Mountain, Multnomah County, August 27. (Boyce)

+Needle cast caused by Hypoderma robustum Tub. f. latispora Dearness

Oregon - unimportant; Cloud Cap Inn, Hood River County, July 24. (Boyce)

FIR, BALSAM (Abies balsamea)

+Rot caused by Polyporus balsameus Pk. = (Coriolus balsameus Murr.)

Minnesota - first time reported in state; causes rapid deterioration of trees or logs; Cook County. (Sect. Pl. Path.)

+Polyporus caesius Fr.: Minnesota - Cook County. (Sect. Pl. Path.)

Leaf blister rust caused by Uredinopsis mirabilis (Pk.) Magn. = (Peridermium balsameum Pk.)

*Minnesota - Polk and Itasca Counties. (Sect. Pl. Path.)

Prior reports: *New Hampshire, *New York, Pennsylvania and Wisconsin.

FIR, GREAT SILVER (Abies grandis)

+Needle cast caused by Lophodermium abietis Rostr.

British Columbia - unimportant; Qualicum Beach, Vancouver Island, May 15. (Boyce)

FIR, DOUGLAS (Pseudotsuga douglasi)

Mistletoe caused by Razoumofskya douglasii (Engelm.) Kuntze

Oregon - caused serious suppression of infected trees; Upper Hood River Valley, Hood River County, July 25. (Boyce)

Prior reports: Idaho, Oregon and Washington.

+Needle blight caused by Rhabdocline pseudotsugae Syd.

*Oregon - rather common; resulted in considerable injury to young trees; by August badly infected trees had lost all but the needles of the current season; Hebo, Tillamook County, May 9. (Boyce)

British Columbia - results same as that of Oregon; Qualicum Beach, Vancouver Island, May 15. (Boyce)

Douglas fir canker caused by Phomopsis pseudotsugae Wilson

Recent literature:

Metcalf, Haven. Observations on the Douglas fir canker in Great Britain. (Abstract) Phytopath. 14: 52. Jan. 1924.

+Sugar exudation - cause unknown

Washington - this physiological phenomenon caused by certain climatic conditions and characterized by deposits of sugar in the form of drops on the tips of the needles or irregular masses on the needles and twigs has been described by John Davidson in a paper entitled "Douglas Fir Sugar" (Canadian Field Naturalist 33: 6-9. Apr. 1919). In August 1923 this sugar was produced in an enormous quantity on the Douglas firs in the general region of Twisp, Okanogan County. (Boyce)

Decay - various causes.

Recent literature:

Boyce, J. S. A study of decay in Douglas fir in the Pacific Northwest. U. S. Dept. Agr. Bul. 1163. 1923.

HEMLOCK, WESTERN (Tsuga heterophylla)
Rust caused by Caeoma dubium Ludwig
+Oregon - caused negligible injury. (Boyce). Prior report: *Washington.
+Sooty mold caused by Dimerosporium tsugae Dearn.
Oregon - on the needles; was unimportant. (Boyce)
Brown rot and butt-rot caused by Fomes annosus (Fr.) Cke.
+Oregon - frequently found. (Boyce). Prior report: Washington.
+Red-brown butt-rot caused by Polyporus schweinitzii Fr.
Oregon - caused slight loss. (Boyce)
+Hemlock mistletoe - Razoumofskya tsugensis Rosen.
British Columbia - found at Qualicum Beach, Vancouver Island. (Boyce)
+Needle rust caused by Uredo holwayi Arth.
Montana - caused negligible injury. (Boyce)

HEMLOCK (Tsuga spp.)
+Leafspot caused by Rhizoctonia sp.
Connecticut - caused considerable loss to one and two-year old seedlings. (Gravatt)
+Rust caused by Pucciniastrum hydrangeae (B. & C.) Arth. = (Thekopsora hydrangiae (Farl.) P. Magn.)
Maryland - light infection. (Hahn)

JUNIPER - See Cedar

LARCH, WESTERN (Larix occidentalis)
Leaf cast caused by Hypodermella laricis Tub.
Recent literature:
Schmitz, Henry. Leaf cast of Larix occidentalis by Hypodermella laricis Tub. in north Idaho. Phytopath. 13: 505-506. Nov. 1923.
"Is of a serious nature as it appears in Idaho."
Prior reports: *Idaho and *Oregon.

PINE, SHORE (Pinus contorta)
+Rust caused by Coleosporium solidaginis (Schw.) Thuem.
Washington - reported once. (Boyce)
Western pine gall rust caused by Cronartium harknessii (Moore) Meinecke.
Abundant in British Columbia, +Washington and Oregon. (Boyce)
Prior reports: Idaho and Oregon.
Rust caused by Cronartium pyriforme (Pk.) Hedgc. & Long.
Montana - reported twice. (Boyce. Prior report: Idaho.

PINE, WESTERN WHITE (Pinus monticola)
Blister rust caused by Cronartium ribicola Fisch.
See Pine, Eastern White - white pine blister rust.

PINE, MUGHO (Pinus montana var. mughus Willk.)
Sweet fern rust caused by Cronartium comptoniae Arth.
+Connecticut - (Clinton). Prior report: New Hampshire.

PINE, AUSTRIAN (Pinus nigra)
Winter injury
Connecticut - killed buds and young branches. (Clinton)

PINE, LONGLEAF (Pinus palustris)

*+Leafspot caused by Septoria acicola (Thuem.) Sacc. (Cryptosporium acicolum Thuem.)

Louisiana - Bogalusa, Washington County, July 27; collected by C. W. Edgerton. "This fungus was first described as Cryptosporium acicolum Thuem. on leaves of Pinus variabilis collected at Aiken, South Carolina by H. W. Ravenel in 1876. It was identified in 1922 from a specimen from the Florida National Forest (Western Division) on leaves of 3 to 5 year Pinus taeda." (Jenkins)

PINE, WESTERN YELLOW (Pinus ponderosa)

Sweet fern rust caused by Cronartium comptoniae Arth.

+Connecticut - (Clinton). Prior reports: Michigan and New Hampshire.

Gall rust caused by Cronartium cerebrum (Pk.) Hedgc. & Long

+Wisconsin -(Vaughan). Prior report: Pennsylvania.

Rust caused by Cronartium filamentosum (Pk.) Hedgc. & Long.

Washington - Spokane and Stevens Counties. (Heald & Dana)

Rust caused by Cronartium pyriforme (Pk.) Hedgc. & Long.

Oregon - (Boyce). Prior reports: California, Idaho, *Montana, Oregon and Washington.

*+Rust caused by Cronartium stalactiforme Arth.

Montana - (Weir)

Frost heaving of seedlings

Recent literature:

Hoasis, F. W. Frost heaving of western yellow pine seedlings. Ecology. 4: 378-390. Oct. 1923.

PINE, RED (Pinus resinosa)

Leafspot caused by Rhizoctonia sp.

+Connecticut - causing considerable loss to one and two-year old seedlings. (Gravatt). Prior report: Minnesota.

PINE, WHITE (Pinus strobus)

Canker caused by Caliciopsis pinea Pk.

+New York - common about Catskill, Greene County, June 18. (Chupp) Prior reports: Maine, *Massachusetts and *Pennsylvania.

Leafcast caused by Hypoderma strobicola Tub.

+North Carolina - Biltmore, Buncombe County. Prior reports: *Maine, Massachusetts, New Hampshire, Pennsylvania and Rhode Island.

+Wood rot caused by Polyporus berkeleyi Fr.

Minnesota - parasitic on roots causing a reddish rot; Itasca County. (Sect. Pl. Path.)

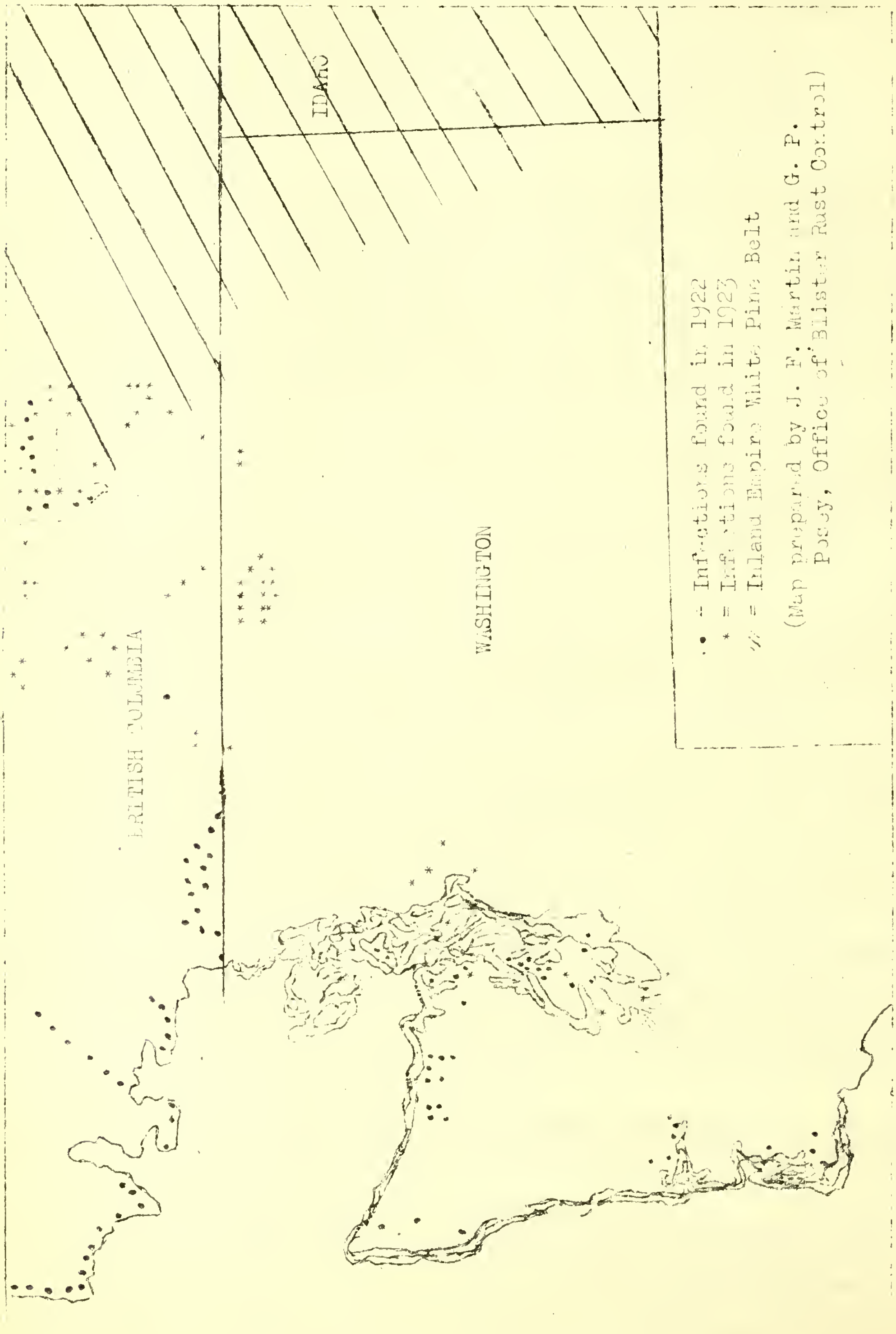
Sun scald of needles caused by winter injury or drouth.

Massachusetts - general; rather serious. (Osmun)

STATUS OF WHITE PINE BLISTER RUST CONTROL IN THE UNITED STATES IN 1923

(Prepared by J. F. Martin and G. B. Posey, Office of Blister Rust Control)

White pine blister rust (Cronartium ribicola Fischer) became established in western North America about 1910. The initial source of infection is believed to be a shipment of five-needled pine planting stock from France received at Vancouver, British Columbia in 1910. The disease was first discovered near Vancouver in 1921 at which time it was already widely spread on both Ribes and pines in western British Columbia and on Ribes in western Washington. The following map shows the known distribution of blister rust in western North America as of December 31, 1923.


IDAHO
WASHINGTON
BRITISH COLUMBIA
● = Infections found in 1922
* = Infections found in 1923
// = Inland Empire White Pine Belt

(Map prepared by J. F. Martin and G. P. Posey, Office of Blister Rust Control)

Fig. 13. Spread of White Pine Blister Rust in the Northwest 1922-1923.

The European black currant (Ribes nigrum), sometimes called the cultivated black currant, has been chiefly responsible for the wide distribution of the blister rust in the Northwest. This plant while of negligible value to horticulture is extremely susceptible to the blister rust. It becomes heavily diseased at long distances from an established source of infection and readily establishes new outbreak centers. Because of these facts it is a nuisance in many regions and the western white pine growing states, including Montana, Idaho, Washington, Oregon and California jointly with the U. S. Department of Agriculture are conducting a campaign to eliminate this plant and to discourage its further propagation in order to prevent the rapid extension of blister rust into disease free regions.

During the past two years these primary host plants have been largely eliminated in western Montana, northern Idaho, western and northeastern Washington. The campaign is being vigorously prosecuted in all of these western states including California. That the cultivated black currant is an important factor in the initial spread and local establishment of the rust is shown by the occurrence of the disease in western Washington. In this region, the widespread infection on cultivated black currants resulted from wind borne aeciospores emanating from pine infection centers in British Columbia. The few diseased pines that have been found in western Washington indicate that the rust first appeared in the state in 1916 or 1917. Five years later (1922) in determining the distribution of the rust, an inspection of 43,039 European black currants found growing in gardens throughout the 12 infested counties in western Washington, showed that 2.1 percent were diseased. On the other hand, only a trace of the rust was found on the several hundred thousand of other cultivated Ribes examined in connection with this work and even when found diseased, they were always growing next to or among infected cultivated black currants.

In addition to systematic eradication of Ribes nigrum in these western states, the work consists of control reconnaissance, investigations of the behavior of the rust in the infested region of British Columbia and studies of Ribes conditions in the forested sections of the border states. In cooperation with the U. S. Forest Service, eradication of wild Ribes on national forests in northern Idaho is being conducted experimentally, with a view toward carrying out the ten-year program advocated by the Western White Pine Blister Rust Conference.

In the Eastern United States there has been practically no change in the limits of the infested region. The disease is present in the Lake States, New York, New England, New Jersey and Pennsylvania. In general within this region, the rust has increased in volume in unprotected areas with consequent increase in damage to the white pine crop.

As the disease becomes more generally established on pine, the percentage of Ribes infected also increases. Some idea of this increase on cultivated Ribes is obtained from data collected in Massachusetts. So far as known, blister rust has been present in that state since about 1902. Later it became established at many points through the planting of imported white pines, which proved to be more or less infected with blister rust. In 1917, the inspection of 923,000 cultivated currant and gooseberry plants growing in gardens throughout the state gave the following results:

Table 60. Rust infection of cultivated Ribes in Massachusetts, 1917.

Species	Number of plants inspected	Percent infected
Black currants (R. nigrum)	47,996	75
Flowering currants (R. aureum and R. odoratum	11,999	38
Red and white currants (R. vulgare)	754,091	19
Gooseberries (R. reclinatum)	108,914	12
Total	923,000	26

From these results it is seen that infection on cultivated Ribes fifteen years after the first appearance of the rust in the state averaged 26 percent. By species, the percentage of infection varied widely, ranging from 12 percent for gooseberries to 75 percent for black currants, depending upon their relative susceptibility.

In the East, general control of the rust is actively under way. The intensive service campaign undertaken in 1922 by the Department in cooperation with the infested states has made good progress. About 40 blister rust control agents are engaged in securing the general protection of the white pine crop by furnishing the expert advice, local leadership and supervision needed to promptly obtain the widest possible application of local leadership and supervision needed to promptly obtain the widest possible application of local control measures by pine owners.

During the two years this cooperative control program has been under way, currants and gooseberries have been destroyed on local control areas aggregating 1,377,452 acres of land in the cooperating states at an average cost of 19 cents per acre. The public is interested in this work and without its excellent cooperation these results could not have been achieved. Some idea of the volume of this cooperation is apparent from the active participation of 2,139 individuals and 180 towns. These individuals and towns expended $125,545 on cooperative control work during the past two years. Also the U. S. Forest Service is cooperating in applying control measures on the White Mountain National Forest. Much of the white pine on this reserve has already been protected from blister rust by the eradication of Ribes.

WHITE PINE BLISTER RUST IN PENNSYLVANIA, 1923

(Prepared by W. A. McCubbin, Department Director,
Pennsylvania State Department of Agriculture)

The work of the 1923 season was a continuation of the policy of 1922, which involved (1) a survey to determine the actual extent of infestation in the state by examination of both pines and Ribes, but particularly the latter; (2) a survey of the wild Ribes in the sections likely to be soonest affected, to determine the average numbers occurring in four common types of habitat, fencerows, pasture, woodland, and swamp.

The results were obtained by cooperation of the Bureau with the office of Blister Rust Control of the Federal Bureau of Plant Industry. One man (L. W. Hodgkins) of the Federal Blister Rust Control staff was detailed to scout in the northern counties not covered in 1922, his work being directed by this Bureau which also provided him with a Ford car for transportation. In the period from September 4 to 16, he scouted in the four northern counties, Potter, Tioga, McKean and Lycoming, finding no sign of the disease anywhere on either pines or Ribes.

Table 61: Summary of wild Ribes survey, Pennsylvania, 1923.

TYPE OF COUNTRY*									
	FENCE			PASTURE			WOODLAND		
	No. of examinations	Length in yards	No. of Ribes	No. of examinations	Area in acres	No. of Ribes	No. of examinations	Area in acres	No. of Ribes
Potter County	0			7	1.875	122	1	.25	17
Tioga County	2	78	35	4	1.75	123	0		
McKean County	0			2	2.25	37	2	4.50	216
Lycoming County	0			2	2.25	2	1	.25	12
Total	2	78	35	15	8.125	284	4	5	245

* No examinations made in swamp country.

Recent literature

Barss, H. P. and George A. Root. The menace of the white pine blister rust. Bienn. Rep. Bd. Hort. Oregon 17: 220-226. 1923.

Baxter, D. V. White pine blister rust in Michigan. Phytopath. 13: 285-286. 1923.

__________ The genus Ribes with reference to the white pine blister rust in the West. Papers Michigan Acad. Sci. 2: 1-2. 1923.

__________ and G. H. Coons. White pine blister rust in Michigan. Quart. Bul. Michigan Agr. Exp. Sta. 5: 193-196. May 1923.

Cook, Mel. T. Blister rust of the white pine. Phytopath. 13: 283. 1923.

Detwiler, S. B. Spare the currant and spoil the pine. Amer. Forest. 29: 337-340. 1923.

Filler, E. C. Controlling white pine blister rust in the Northeastern States. (Abstract) Phytopath. 14: 53. 1924.

McCallum, A. W. The present status of white pine blister rust in Canada. (Abstract) Phytopath. 13: 291. 1923.

Pennington, L. H. Wind dissemination of aeciospores of Cronartium ribicola Fischer. (Abstract) Phytopath. 14: 52-53. 1924.

Posey, G. B. and E. R. Ford. Survey of blister rust infection on pines at Kittery Point, Maine, and the effect of Ribes eradication in controlling the disease. (Abstract) Phytopath. 14: 53. 1924.

Randall, C. E. Farming the forest for a pine crop. Amer. Forest. 29: 195-198, 250. 1923.

Reynold, B. A. Campaign against white pine blister rust may save future California millions. Fruitm. 3: 5, 11-12. Nov. 1923.

Robinson, C. L. Quarantine conditions in Washington with special reference to white pine blister rust eradication. Month. Bul. Dept. Agr. California 12: 262-263. June 1923.

Schellenberg, H. C. Die Empfänglichkeit der Ribesarten für den Rost der Weymouthkiefer. (The susceptibility of Ribes species to White Pine blister rust) Schweiz. Zeitschr. fur Forstwesen, 74: 25-50. 1923.

Anonymous. Report of the proceedings and recommendations of the eigth annual blister rust conference held in Boston, Massachusetts, February 8-10. 1923.

________ Pine blister disease in Europe. Amer. Forest. 29: 244. 1923.

________ Investigator finds pine disease general in Europe. Southern Lumber Jour. 49: 39. 1923.

________ White pine blister rust. Wisconsin Dept. Agr. Bul. 52: 72-76. Dec. 1922.

White pocket rot caused by Fomes pini Nees

In Supplement 29, page 403 a dry rot was reported as being caused by Fomes pinicola Fr. & Cke. This was an error as the fungus causing the dry rot was Fomes pini, formerly called Trametes pini Fr. Fomes pini is very common in the White Mountains but Fomes pinicola is rather rare, this is an important difference according to Walter H. Snell (Rhode Island) because Fomes pini is the important agent of decay in white pine while Fomes pinicola is almost negligible. Also, according to Snell the disease is called white pocket rot as dry rot is caused by Merulius lacrymans.

PINE, SCRUB (Pinus virginiana)

Rust caused by Cronartium cerebrum (Pk.) Hedgc. & Long.

+Delaware - increasing prevalence found in Sussex and Kent Counties. (Adams). Prior reports: District of Columbia, *Maryland, New Jersey and Pennsylvania.

PINE (Pinus spp.)

Rust caused by Coleosporium solidaginis (Schw.) Thuem.

+Florida - found very plentiful on young trees up to eight feet tall; infecting 90% of the leaves; widespread. (Weber)

Prior reports: Georgia, Minnesota, New Jersey and New York.

Rust caused by Cronartium cerebrum (Pk.) Hedgc. & Long.

*+Mississippi - Moy, Attala County. (Neal & Barker)

Prior reports: Georgia and Maryland.

Leafspot caused by Septoria acicola (Thuem.) Sacc.

+Louisiana - is causing trouble in the reforestation projects; of considerable importance; 100% injury in one planting. (Edgerton)

Prior reports: *Missouri and South Carolina.
White spot caused by excessive soil temperature
New Hampshire - injury to seedlings. (A. E. Gravatt)
Damping-off cause unknown
New Hampshire and Massachusetts. (A. E. Gravatt)
Wisconsin - serious in state conservation nursery; sulphuric acid control most effective of remedies tried. Pythium sp. may be cause. (Vaughan)

RETINOSPORA
+Phomopsis juniperovora Hahn
Pennsylvania - (Hahn)

SPRUCE, BLACK (Picea mariana)
+Brown heartwood rot caused by Fomes officinalis Fr.
Minnesota - found on a living tree, Itasca County. (Sect. Pl. Path.)
Leaf blister rust caused by Melampsoropsis ledicola (Pk.) Arth.
Minnesota - Carleton County. (Sect. Pl. Path.)
Prior report: *Minnesota.
+Polyporus circinnatus Morgan
Minnesota - attached to roots, Itasca County. (Sect. Pl. Path.)
+Wood rot caused by Polyporus guttulatus Pk.
Minnesota - Itasca County. (Sect. Pl. Path.)

SPRUCE, SITKA (Picea sitchensis)
+Red-brown root and butt rot caused by Polyporus schweinitzii Fr.
Oregon - was frequent in an over-mature stand (340 to 360 years old) but in the aggregate the loss was much less than 1%; Waldport, Lincoln County, October 9. (Boyce)
+Pecky wood rot caused by Trametes pini (Brot.) Fr.
Oregon - was occasional in an over-mature stand (340 to 360 years old) the aggregate loss was less than 1%; Waldport, Lincoln County, October 9. (Boyce)

SPRUCE (Picea spp.)
Stem canker - cause unknown
Connecticut - new to state; forms a resinous canker on branches which finally die; Stamford, Fairfield County, June 26. (Bartlett & Clinton)

DISEASES OF HARDWOODS

ALDER, SPECKLED (Alnus incana)
Powdery mildew caused by Erysiphe aggregata (Pk.) Farl.
New York - Tompkins County, July 4. Collected by R. S. Kirby. (Chupp). Prior reports: *Maine. *New York and *Wisconsin.
Catkin deformation caused by Exoascus tosquinetii Sacc. (Exoascus amentorum Sade), (Taphrina amentorum Sade)
*Minnesota - Itasca County. (Sect. Pl. Path.). Prior report: Idaho.
Recent literature:
Klebahn, H. Infektionsversuche mit Taphrina tosquinetii. (Infection experiments with Taphrina tosquinetii) - Ber. deutsch. Bot. Gesellsch. 41: 109. 1923.

*+Taphrina robinsoniana Gies.

New York - Onondaga, Oswego and Tompkins Counties, September 8. Collected by E. E. Honey and D. Reddick. (Chupp)

+Leafspot caused by Gloeosporium sp.

New York - Enfield Gorge, Tompkins County, July 4. Collected by R. S. Kirby. (Chupp)

ALDER, RED (Alnus rubra)

Leafspot caused by Cercosporella alni Dearn. & Barth.

*+Oregon - of negligible importance, Macleay Park, Portland, Multnomah County, August 2. (Boyce). Prior report: *Washington.

*+Diaporthe sp.

British Columbia - some damage was being done by the killing of many twigs and branches on trees of all sizes; Qualicum Beach, September 5. (Boyce)

Powdery mildew caused by Microsphaera alni (Wallr.) Wint.

*+Oregon - rare; small amount of injury; Waldport, Lincoln County, October 10. (Boyce). Prior report: *Washington.

ALDER, HAZEL (Alnus rugosa)

+Taphrina robinsoniana Gies.

*Maryland - vicinity of Cabin John, Montgomery County, autumn; collected by E. K. Cash and A. E. Jenkins. (Jenkins)

*Virginia - vicinity of Black Pond, Fairfax County; collected by A. E. Jenkins, July 12, 1922. (Jenkins)

ALNUS, MOUNTAIN (Alnus tenuifolia)

*+Exoascus spp.

Oregon - Oregon Caves, August 26; collector R. Kent Beattie; apparently two different species present, one on leaves and the other on fertile catkins. (Jenkins)

ASH, WHITE (Fraxinus americana)

Anthracnose caused by Gloeosporium aridum Ell. & Holw.

Connecticut - only complaint of injury to shade trees for several years; Portland, Middlesex County, June 20. (Clinton)

Prior reports: Connecticut, District of Columbia, Massachusetts, and *Wisconsin.

Leafspot caused by Gloeosporium sp.

+New York - common in Cascadilla, George and Tompkins Counties, October 10. Collected by E. F. Guba. (Chupp)

Prior reports: Delaware and Massachusetts.

Leafspot caused by Phyllosticta sp.

New York - common; Tompkins County, September 10. (Chupp)

Rust caused by Puccinia peridermiospora (Ell. & Tr.) Arth., (P. fraxinata (Lk.) Arth.), (Aecidium fraxini Schw.)

Connecticut - of average importance; Fairfield, New Haven, New London and Middlesex Counties.

+New York - in one case nearly all the leaves of a very large tree were severely affected causing dying of trees: Nassau and Suffolk Counties; also reported as "all over a number of five-year old trees." (Chupp)

Prior reports: *Colorado, Connecticut, Delaware, *District of Columbia, *Illinois, Iowa, *Massachusetts, Minnesota, *Missouri, *Nebraska, *Pennsylvania and *Wisconsin.

*+Canker caused by Sphaerographium fraxini (Pk.) Sacc.
New York - severe on one tree causing killing of branches; Wyoming County, August 24. Collected by E. F. Guba. (Chupp)

ASH (Fraxinus spp.)
White heartwood rot caused by Fomes fraxinophilus Pk.
Missouri - causing a heart rot of living trees, Taney and Texas Counties. (Rhoads)

ASH, MOUNTAIN (Sorbus americana)
Rust caused by Gymnosporangium globosum Farl.
*+New York - Water Mill, Suffolk County, June 25. Collected by S. W. Squires. (Chupp)
Prior reports: Maine, *Massachusetts and Vermont.
Winter injury
Washington - Okanogan County. (Heald & Dana)

ASPEN - See Populus tremuloides

BASSWOOD - See Linden

BIRCH, EUROPEAN WHITE (Betula alba)
Canker caused by Melanconium bicolor Nees.
New York - killing top of tree; a weak parasite; Genesee County, August 2. Collected by E. F. Guba. (Chupp)
Prior reports: *Indiana and New York.

BUTTERNUT (Juglans cinerea)
Anthracnose caused by Gnomonia leptostyla (Fr.) Ces. & DeNot. (Marssonia juglandis (Lib.) Sacc.)
New York - defoliates most of the trees in the state; found wherever butternuts are grown; Wayne County, August 10. (Chupp)
Prior reports: *Illinois, Indiana, *Iowa, *Massachusetts, Michigan, *Mississippi, New York, *Ohio, *Pennsylvania, *Washington, West Virginia and *Wisconsin.

CAMPHOR (Cinnamomum camphora)
+Colletotrichum sp., +Gloesporium sp., Pestalozzia sp., +Phoma sp., and +Leptothyrium pomi (Mont. & Fr.) Sacc. These organisms have been collected in Florida as parasitic upon the host plant and doing considerable damage; names in order of importance; the anthracnose diseases were by far the most important; a severe outbreak was reported from Perry in which a considerable number of trees were killed, it was found that the severity of the disease was probably due to association with thrip injury. (Weber)

CATALPA (Catalpa sp.)
Powdery mildew caused by Microsphaera alni var. vaccinii (Schw.) Salm.
*+New York - Wayne County, July 10. Collected by R. S. Kirby. (Chupp)
+Delaware - appeared very prevalent following heavy rains in September, New Castle County, September 29. (Adams)
Prior reports: Connecticut, *District of Columbia, *Illinois, *Indiana, Massachusetts, *Nebraska, *Ohio, *Pennsylvania and West Virginia.

Leafspot caused by Phyllosticta catalpae Ell. & Mart.

New York - on Catalpa bignonioides and C. speciosa, Orleans County, June 26. (Chupp)

Ohio - causes malformation and defoliation of leaves; of rather general range in state; associated with catalpa midge spot; Wayne County, July. (Detmers)

Prior reports: Delaware, *District of Columbia, *Indiana, *Kentucky, Louisiana, *Maryland, *Massachusetts, Michigan, *Mississippi, Missouri, New Hampshire, New Jersey, New Mexico, *Ohio, Pennsylvania, *South Carolina and West Virginia

Leafscorch caused by high temperatures.

Kansas - Douglas County. (White)

CERCIS SP. - See Redbud

CHERRY, WESTERN CHOKE (Prunus demissa)

+Leafspot caused by Septogloeum nuttallii Hark.

Oregon - rare; Macleay Park, Portland, Multnomah County, August 2. (Boyce)

CHERRY, PIN (Prunus pennsylvanica)

+Leafspot caused by Coccomyces sp.

New York - Cattaraugus County, June 25. Collected by Kirby and Honey. (Chupp)

CHERRY, BLACK (Prunus serotina)

Shot hole caused by Coccomyces lutescens Hig.

+New York - general; Nassau County, June 9. Collected by Kirby and Honey. (Chupp). Prior reports: Georgia and Illinois.

Black knot caused by Plowrightia morbosa (Schw.) Sacc.

*+New York - Nassau County, June 9. Collected by W. D. Mills. (Chupp)

Prior reports: *Alabama, Connecticut, *Maine, *Maryland, Massachusetts, Minnesota, Pennsylvania and *West Virginia.

Brown rot caused by Sclerotinia seaveri Reade

New York - new for state; Dutchess County. (Guba); Tompkins County, June 11. (Chupp)

Prior reports: *Iowa, *Virginia and *Wisconsin.

CHERRY, COMMON CHOKE (Prunus virginiana)

+Shot hole caused by Coccomyces lutescens Hig.

New York - very common everywhere, Tompkins County, May 16. (Chupp)

Black knot caused by Plowrightia morbosa (Schw.) Sacc. (Dibotryon morbosum Theissen & Sydow)

Minnesota - found chiefly on Prunus virginiana throughout state, Ramsey County, May 22. (Sect. Pl. Path.)

Prior reports: Connecticut, Iowa, *Massachusetts, Minnesota and Montana.

Powdery mildew caused by Podosphaera oxyacanthae (DC.) Deby.

New York - Tompkins County, June 11. (Chupp)

Prior reports: *Colorado, Connecticut, *Massachusetts, Minnesota, *Montana, *South Carolina, New York and *North Dakota.

Brown rot caused by Sclerotinia angustior Reade

*+New York - common and statewide; Tompkins County, May 13. (Chupp & Guba). Prior report: *North Dakota.

+Brown rot caused by Sclerotinia demissa Dana

Minnesota - unimportant but interesting; more prevalent than in 1922; causes a twig blight; ranges over southern half of state; period of greatest injury May 18 to July 1; heavy infections after each rain; Prunus virginiana very susceptible, Ramsey County. (Sect. Pl. Path.)

CHESTNUT (Castanea dentata)

Canker caused by Endothia parasitica (Murr.) Anderson

"This disease continued its rapid spread during 1923. A large spot infection was found covering parts of Greenville County, South Carolina, and Henderson and Polk Counties in North Carolina as noted in a previous bulletin. Later inspections have shown that the disease was present in 1923 on a large area in Union, Fannin and Gilmer Counties, +Georgia, and in Polk County, +Tennessee.

"A number of chestnuts, mostly of Asiatic origin, have survived the attacks of the blight. These trees are recorded when reported by various parties and a number of them have already been inspected. It is hoped in this way and by systematic field inspection, to locate the strains of chestnut which will be sufficiently resistant to the blight that the chestnut will continue to be one of our valuable nut and ornamental trees.

"The map (Fig. 14) showing the present distribution of the disease is based upon very limited field inspection, as funds available for chestnut blight work are small. A number of counties have been included within the infected zone, although it is not known that actual infection occurs within them. They are placed there on account of their nearness to large infections and the certainty that infections would be found in them on inspection."

Prior reports: Alabama, *Connecticut, Delaware, Indiana, Iowa, Kansas, *Maine, *Maryland, *Massachusetts, Michigan, Missouri, *Nebraska, New Hampshire, New Jersey, *New York, *North Carolina, Ohio, *Pennsylvania, *Rhode Island, South Carolina, Vermont, *Virginia and *West Virginia. (G. F. Gravatt)

+Powdery mildew caused by Microsphaera alni (Wallr.) Wint.

Connecticut - Kent, Litchfield County, October 11. (Clinton)

New York - Broome, Cortland, Onondaga and Tompkins County, July 4. Collected by R. S. Kirby. (Chupp)

Powdery mildew caused by Phyllactinia corylea (Pers.) Karst.

+New York - Schuyler County, August 2. Collected by R. S. Kirby. (Chupp). Prior report: *Indiana.

+Brown checked woodrot caused by Polyporus sulphureus (Bull.) Fr.

New York - Tompkins County, September 17. Collected by Honey and Guba.

Bacterial leafspot - cause unknown

Kansas - one tree out of thirty-one infected; severe infection caused leaf drop, July 10. (White)

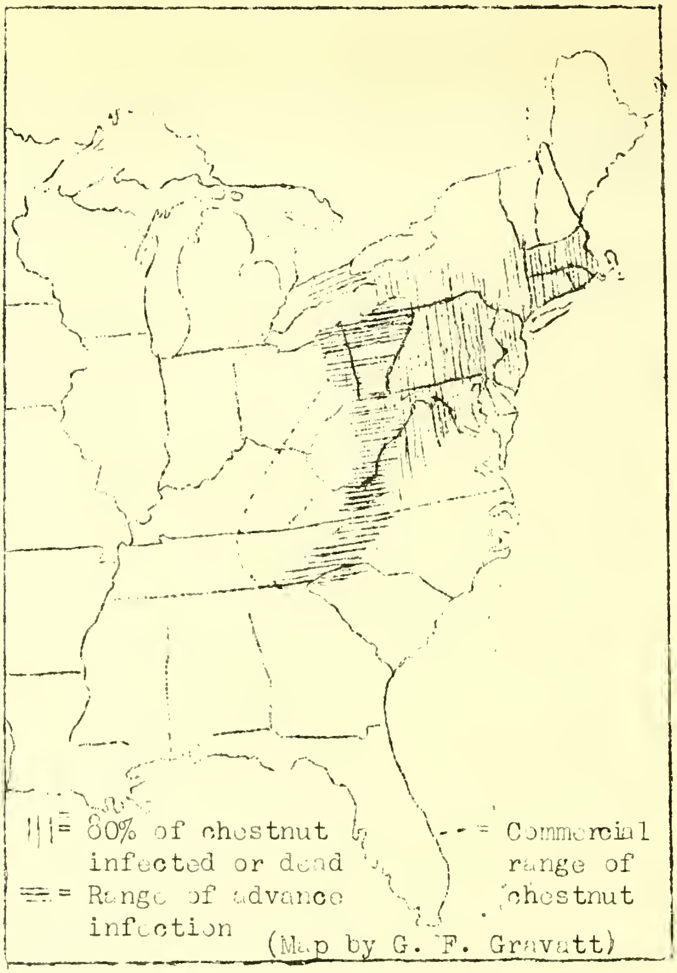

||| = 80% of chestnut infected or dead
═ = Range of advance infection
- - - = Commercial range of chestnut
(Map by G. F. Gravatt)

Fig. 14. Known distribution of chestnut blight, 1923.

Recent literature:

Belsani, E. Il male dell'inchiostro nei castagneti. Il Coltiv. 69: 278-281. Mar. 1923.

Biers, P. Le Schizophyllum commune Fries sur Châtaignes du Japon. (Schizophyllum commune Fries on Japanese Chestnuts.) Rev. Path. Vég. et Ent. Agr. 101: 151-153. 1923.

Dufrénoy, J. Les maladies du chataignier. (The diseases of the chestnut.) Compte Rendu du Congres Regional a Brive. 45-63. 1922.

LoPriore, Giuseppe. The "ink disease" of the chestnut. Int. Rev. Sci. & Pract. Agr. 1: 600-607. July - Sept. 1923.

Mangin, L. A. The restoration of chestnut woods. Intern. Rev. Sci. & Pract. Agr. n. s. 1: 37-42. Jan. - Mar. 1923.

Marchal, Paul. Recherches sur les maladies des chataigniers. Ann. Epiph. 9: 134-135. 1923.

Petri, L. Sul modo di diffondersi del mal dell'inchiostro del Castagno e sui mezzi piu efficaci per combatterlo. (On the mode of spread of the ink disease of the chestnut and on the most efficasious means of control.) Nuovi Ann. Min. Agr. 3: 3-19. 1923.

Piccioli, L. Monografia del Castagno (Monograph on the chestnut). 8: 397. 1922.

Schell, E. Diseases of the French Chestnut tree -- particularly the ink malady. Jour. Amer. Leather Chem. Assoc. 17: 353-359. 1922.

CHINABERRY (Melia azedarach)

Canker caused by Nectria sp.

+Mississippi - a rather serious blighting of the limbs was caused by this disease, appeared to be widespread throughout the state. (Barker & Neal)

+Root rot caused by Ozonium omnivorum Shear

Arizona - Pima and Yuma Counties. (Brown)

CHINQNAPIN, GIANT (Castanopsis chrysophylla)

+Leafspot caused by Dothidella castanopsidis Dearn.

Oregon - common but caused little injury; Hood River and Lane Counties. (Boyce)

COFFEE TREE, KENTUCKY (Gymnocladus dioica)

Leafspot caused by Cercospora gymnocladi Ell. & Kell.

Missouri - Columbia, Boone County, September 28. (Maneval)

Prior reports: *Illinois, *Kansas, *Missouri and *Nebraska.

DOGWOOD, PAGODA (Cornus alternifolia)

Powdery mildew caused by Microsphaera alni (Wallr.) Wint.

New York - Tompkins County, August 18. Collected by E. E. Honey. (Chupp)

Prior reports: *Connecticut, Iowa, *Massachusetts, *New York and *Pennsylvania.

DOGWOOD, PACIFIC (Cornus nuttalli)

Powdery mildew caused by Phyllactinia corylea (Pers.) Karst.

Oregon - was more or less common but caused little injury; Portland, Multnomah County, October 22. (Boyce)

Prior reports: *Oregon and *Washington.

DOGWOOD, RED (Cornus occidentalis)

Powdery mildew caused by Phyllactinia corylea (Pers.) Karst.

+Oregon - rare; Portland, Multnomah County, October 22. (Boyce)

Prior report: *Washington.

DOGWOOD, ROUNDLEAF (Cornus rugosa)

+Flyspeck cause undetermined

New York - Tompkins County, August 4. (Chupp)

DOGWOOD, RED OSIER (Cornus stolonifera)

Powdery mildew caused by Microsphaera alni (Wallr.) Wint.

+New York - Tompkins County, August 18. Collected by E. E. Honey. (Chupp). Prior report: Wisconsin.

DOGWOOD (Cornus sp.)

Leafspot caused by Cercospora cornicola Tr. & Earle

+Florida - was a very conspicuous disease; in every case severe, often causing complete defoliation in early summer; common on native and cultivated plants and widespread. (Weber)

Prior reports: *Mississippi and *Texas.

Sarcinella heterospora Sacc.

*+Missouri - Columbia, Boone Counties. (Maneval)

Prior report: *West Virginia.

Leafscorch caused by weather
New York - in park at Rochester, Monroe County, September 21; collected by Honey and Kirby; observed on the following Cornus species: alba, koenigii, koreana, kousa and mas. (Chupp)

ELDER, AMERICAN (Sambucus canadensis)
Powdery mildew caused by Microsphaera sp.
+New York - conidial stage; Cayuga (September 15); Monroe and Onondago Counties. (Chupp)
Leafspot caused by Phyllosticta sp.
*+New York - Queens County, September 3. Collected by W. D. Mills. (Chupp)
Rust caused by Puccinia sambuci (Schw.) Arth. (Puccinia bolleyana Sacc.) (Dicaeoma sambuci (Schw.) Arth.)
*+New York - Cayuga, Tompkins and Wayne (July 10) Counties. Collected by R. S. Kirby. (Chupp)
Prior reports: *Georgia, *Indiana, *Iowa, *Maryland, *Massachusetts, *Mississippi, *Nebraska, *Ohio, *Pennsylvania and *Virginia.

ELM, AMERICAN (Ulmus americana)
+Heart rot caused by Collybia velutipes Fr.
Minnesota - Itasca County. (Sect. Pl. Path.)
Black spot caused by Gnomonia ulmea (Sacc.) Thuem. (Dothidella ulmi (Dur.) Wint.) (Gloeosporium ulmeum Miller) (Phyllachora ulmi Fckl.)
New York - statewide; very severe on individual trees; other intermingling trees may not be affected; Tompkins County, July. (Chupp)
+Minnesota - Fillmore County. (Sect. Pl. Path.)
Prior reports: Connecticut, Illinois, Indiana, *Iowa, *Maine, *Mississippi, *Nebraska, *New York, *North Dakota, *Texas, and *West Virginia.
Heart rot caused by Polyporus squamosus (Huds.) Fr.
+New York - Putnam County, June 17. Collected by Kirby and Honey. (Chupp). Prior report: Minnesota.
+Canker caused by Sphaeropsis ulmicola Ell. & Ev.
Pennsylvania and Maryland. (Hahn)

ELM, ENGLISH (Ulmus campestris)
+Canker caused by Sphaeropsis ulmicola Ell. & Ev.
Pennsylvania - (Hahn)

ELM, CORK BARK (Ulmus foliacea suberosa)
+Canker caused by Sphaeropsis ulmicola Ell. & Ev.
Pennsylvania - (Hahn)

ELM, SLIPPERY (Ulmus fulva)
Blackspot caused by Gnomonia ulmae (Sacc.) Thuem.
+New York - statewide in distribution. (Chupp)
Prior reports: Illinois and *Indiana.

ELM, CHINESE (Ulmus parvifolia)
+Root rot caused by Ozonium omnivorum Shear
Arizona - Greenlee and Pima (5 trees killed in Tucson) Counties; this host has been reported as being resistant to this organism. (Brown)

ELM (Ulmus spp.)

Blackspot caused by Gnomonia ulmae (Sacc.) Thuem.

Connecticut - an average amount; Hartford, New Haven, Middlesex and New London (Hodlyme July 5) Counties. (Clinton & Stoddard)

+Alabama - important locally, caused early defoliation; Elmer County. (Miles)

Oklahoma - very prevalent; Payne County, October 15. (Stratton)

+Missouri - very common every year. (Maneval)

+Kansas - somewhat general. (White)

Canker caused by Sphaeropsis ulmicola Ell. & Ev.

+Ohio - (A. E. Gravatt)

Wisconsin - of major importance; more prevalent than average year; found mostly in the eastern and southern sections of the state; was the cause of affected trees in 26 nurseries to be condemned and destroyed; not found in the woods. (Vaughan)

Prior report: Wisconsin.

Powdery mildew caused by Uncinula macrospora Pk.

+Oklahoma - not prevalent, Payne County, November 4. (Stratton)

Prior reports: *Illinois, *Iowa, *Kansas, *Massachusetts, Nebraska, *New York, *North Carolina, Ohio and South Carolina.

Spray injury caused by arsenate of lead and unknown factors

Connecticut - three complaints; Fairfield (Norwalk, June 24) and New London Counties. (Clinton)

Canker cause unknown

Connecticut - new to state; a Nectria-like canker in bark, often very large; saw similar cankers at Amherst, Massachusetts, where the trouble has been known some time; New Haven and Stamford Post Road, June 26. (Clinton)

Recent literature:

Malaquin, A. La maladie des Ormes. (The disease of the elms). Renaiss. Agr. 4: 91-94. 1923.

Schwarz, M. B. Das zwergsterben der ulmen, trauerweiden und pfirsichbäume Meded. Phytopath. Labor Willie Comm. Scholt. Amst. 5: 73. Dec. 1922. Graphium ulmi n. sp., Phoma intricans n. sp., Litteraturverzeichnis.

Spierenburg, Dina. A new elm tree disease. Rept. Internat. Conf. Phytopath. & Econ. Entomol. Holland: 123-124. H. Veenman & Sons, Wageningen, 1923.

Suringar, J. V. Eine ulmenkrankheit in Holland. Mitt. Dent. Dendrol. Ges. 32: 145-147. 1922.

EUCALYPTUS (Eucalyptus sp.)

Recent literature:

Moore, Don R. Susceptibility of eucalyptus to drought. Australian Forest. Jour. 6: 171-172. 1923.

Murrill, W. A. Poria cocos (Schw.) F. A. Wolf. Mycologia 15: 105-106. 1923.

GUM, SWEET (Liquidambar styraciflua)

+Leafspot caused by Septoria sp.

Florida - caused a complete defoliation of the gum trees situated on the campus of the University of Florida in the middle of the season; it was not reported elsewhere. (Weber)

HAWTHORN, BLACK (Crataegus douglasii)

Incense cedar rust caused by *Gymnosporangium blasdaleanum* (Diet. & Holw.) Kearn.

Oregon - hypertrophied leaves and young shoots, but total damage was slight, Lane County. (Boyce)

Prior reports: *Oregon and *California.

HAWTHORN, SMALL FRUITED (Crataegus spathulata)

Rust caused by *Gymnosporangium floriforme* Thax.

+Mississippi - a heavy infection in Oktibbeha County, September 15. (Neal & Barker). Prior reports: *Alabama and *Arkansas.

HAWTHORN (Crataegus thayer)

+*Scab* caused by *Venturia inaequalis* (Cke.) Aderh.

New York - Rochester Park, Rochester, Monroe County, September 22. (Chupp)

HAWTHORN (Crataegus spp.)

Fire blight caused by *Bacillus amylovorus* (Burr.) Trev.

New York - general throughout the western half of state, Tompkins County, August 1; found by Kirby and Honey at Rochester Park, Rochester, Monroe County, on the following *Crataegus* species: +*illinoiensis*, *oxyacantha*, +*tomentosa*, a trace was found in each instance. (Chupp)

Leafspot caused by *Fabraea maculata* (Lév.) Atk. (*Entomosporium maculatum* Lév.)

+New York - caused defoliation; Rhinebeck, Dutchess County, September 1. Collected by E. F. Guba. (Chupp)

Rust caused by *Gymnosporangium betheli* Kern

*+North Dakota - of general range; unimportant except in few cases; Fargo, Cass County, June 26. (Weniger)

Prior reports: *Colorado, *Montana and *Utah.

Rust caused by *Gymnosporangium germinale* (Schw.) Kern (*Roestelia aurantiaca* Pk.)

*+Connecticut - Kent, Litchfield County, October 11. (Clinton)

New York - Orleans (August 10) and Tompkins (Kent, October 11) Counties. Collected by Fernow.

Prior reports: Arkansas, Delaware, *District of Columbia, *Georgia, *Louisiana, *Maryland, *Massachusetts, *Mississippi, *New Jersey, *New York, *Ohio, *Pennsylvania, *South Carolina, *Texas and *Virginia.

Rust caused by *Gymnosporangium juniperi-virginianae* Schw. (*Roestelia penicillata* Farl.)

+Connecticut - Litchfield County. (Clinton)

*+New York - Westbury, Nassau County, August 10. Collected by W. D. Mills. (Chupp)

Ohio - Wayne County, August. (Detmers)

Prior reports: *Kansas, *Nebraska and *Vermont.

HAZLENUT (Corylus californica)

Leafspot caused by *Septoria corylina* Pk.

*+Oregon - (Boyce). Prior report: *California.

HICKORY (Hicoria sp.)

Anthracnose caused by *Gnomonia caryae* Wolf (*Gloeosporium caryae* E. & D

Connecticut - North Stonington, New London County, September 18. (Clinton)
Prior reports: *Alabama, *Georgia, Massachusetts, *New York, Ohio and South Carolina.

HORSECHESTNUT (Aesculus hippocastanum)
Leaf blotch caused by Guignardia aesculi (Pk.) Stew.
Has been found in Alabama, Connecticut, *Delaware, *District of Columbia, Illinois, Indiana, Iowa, *Maine, *Maryland, *Massachusetts, Michigan, Minnesota, New Hampshire, *New Jersey, *New York, Ohio, Pennsylvania, Rhode Island, Utah, *Virginia, *West Virginia and *Wisconsin.
Coral spot caused by Nectria cinnabarina Fr.
New York - in many cases infected trees were weakened by Guignardia aesculi (Pk.) Stew. and the coral spot completes the killing of the branches; Tompkins County. (Chupp)
Prior reports: Connecticut, *Maine, Massachusetts, New Hampshire, New York and Rhode Island.

IVY, POISON (See Sumach, Poison)

LINDEN, AMERICAN (Tilia americana)
+Leafspot caused by Cercospora tiliae Pk.
New York - Tompkins County, July 4. Collected by R. S. Kirby. (Chupp)
Powdery mildew caused by Uncinula clintonii Pk.
*+New York - Enfield George, Tompkins County, July 4. (Chupp)
Prior reports: *Connecticut, *Florida, *Illinois, *Indiana, Iowa, Massachusetts, *Michigan, *Minnesota, *New Hampshire, *New York, *North Dakota, Ohio and *Wisconsin.
+Flyspeck - cause undetermined
New York - on stems; Tompkins County, August 4. (Chupp).

MAGNOLIA (Magnolia spp.)
Anthracnose caused by Colletotrichum sp.
+Florida - well distributed but caused little damage to foliage or twigs. (Weber). Prior report: South Carolina.
Leafspot caused by Phyllosticta cookei Sacc. (Phyllosticta magnoliae Cke.)
Mississippi - very prevalent in many of the coast counties; in some cases it was so severe that shade trees became unsightly; Harrison County, April 10. (Neal & Barker).
Prior reports: *California, *Mississippi, New York, and South Carolina.

MANZANITA (Arctostaphylos manzanita)
Witches broom caused by Exobasidium vaccinii (Fckl.) Wor.
Oregon - not common; little injury resulted; Homestead Inn, Hood River County, July 25. (Boyce)
Rust caused by Pucciniastrum sparsum (Wint.) Ed. Fisch.
Oregon - was unimportant; Homestead Inn, Hood River County, July 25. (Boyce)

MAPLE, VINE (Acer circinatum)
Leafspot caused by Septoria circinata Ell. & Ev.
+Oregon - abundant but causing little damage to the host; Rujada, Lane County, June 17. (Boyce). Prior report: *Washington.

MAPLE, SILVER (*Acer dasycarpum*)
Blight caused by *Taphrina* sp. see *Acer* spp.

MAPLE, OREGON (*Acer macrophyllum*)
Leafspot caused by *Cercosporella aceris* Dearn & Barth.
*+Oregon - killed some leaves but did little injury to host, Macleay Park, Portland, Multnomah County, August 2. (Boyce)
Prior report: *Washington.
Black speckled leafspot caused by *Rhytisma punctatum* Fr.
*+Oregon - was of negligible importance; Macleay Park, Portland, Multnomah County, October 28. (Boyce)
Prior reports: *California and *Washington.
Leafspot caused by *Septoria circinata* Ell. & Ev.
+Oregon - was of negligible importance; Macleay Park, Portland, Multnomah County, July 29. (Boyce). Prior report: Washington.

MAPLE, BOX ELDER (*Acer negundo*)
Red stain caused by *Fusarium negundi* Sherbakoff
Recent literature:
Hubert, E. E. The red stain in the wood of box elder. Jour. Agr. Res. 26: 447-458. 1923.
Fusarium cinnabarium Sacc. (Alabama and *North Dakota) and *Fusarium pyrochroum* (Desm.) Sacc., (*District of Columbia).
Leafspot caused by *Phyllosticta minima* (Berk. & Curt.) Ell. & Ev.
Connecticut - Wapping, Hartford County, July 20. (Clinton)
Black speckled leafspot caused by *Rhytisma punctatum* Fr.
*+New York - (Dept. Pl. Path.)

MAPLE, BLACK (*Acer nigrum*)
Blight caused by *Taphrina* sp. see *Acer* spp.

MAPLE, NORWAY (*Acer platanoides*)
Leafspot caused by *Gloeosporium* sp.
*New York - Bergen, Genesee County, July 16. (Dept. Pl. Path.)
Prior reports: Connecticut, New York and Virginia.
Leaf fall caused by drought
Connecticut - under severe drought conditions leaves seem to drop off while still green; Whitneyville, New Haven County, June. (Clinton & Stoddard)

MAPLE, RED (*Acer rubrum*)
+*Dodder*, *Cuscuta gronovii* Willd.
New York - Onondaga County, September 15. Collected by E. E. Honey. (Chupp)
Blight caused by *Taphrina* sp. see *Acer* spp.

MAPLE, SUGAR (*Acer saccharum*)
*+*Alternaria* sp.
Iowa - Grinnell, Poweshiek County, October. (Conard)
+*Leaf blight* caused by *Gloeosporium* sp.
New York - occasional tree severely injured; Erie County, June 25. (Chupp)
Powdery mildew caused by *Uncinula circinata* Cke. & Pk.
+New York - Ithaca, Tompkins County, October 1. Collected by E. E. Honey. (Chupp). Prior reports: *Indiana and Iowa.

Frost injury - physiological

Ohio - widespread damage was done to sugar maples in particular and other hardwood trees by the snow storm and severe frost of May 10th throughout central, northern and eastern Ohio. Though a large number of varieties of shade trees were damaged, the sugar maple suffered the greatest injury. The young leaves in the tops of the trees had just developed and were killed by the frost. Buds in the other parts of the trees were swelling, so that the frost injured the leaves within. (Detmers)

MAPLE, MOUNTAIN (Acer spicatum)

Leafspot caused by Phyllosticta minima (Berk. & Curt.) Ell. & Ev.

+New York - Tompkins County, July 4. Collected by R. S. Kirby. (Chupp). Prior report: Wisconsin.

*+Blight caused by Taphrina lethifer (Pk.) Sacc.

New York - Elizabethtown, Essex County; collected by C. H. Peck, June 1886; apparently the only collection of this species; specimen received from Dr. House. (Jenkins)

MAPLE (Acer spp.)

+Twig canker caused by Macrophoma sp.

New York - Big Indian Slide Mountain, Ulster County, June 6. Collected by E. F. Guba. (Chupp)

Canker caused by Nectria cinnabarina Fr.

+Kansas - killing tops of maples; Pittsburg, Crawford County. (White). Prior reports: New York, *Ohio, Pennsylvania, Massachusetts and Washington.

Sap rot caused by Pholiota adoposa Fr.

+Delaware - observed locally as a wound parasite. (Adams)

Prior reports: Massachusetts and New Hampshire.

Leafspot caused by Phyllosticta sp.

*+Georgia - common on sapling maples in woods on Agricultural grounds; Athens, Clark County, June 21. Collected by R. J. Haskell. Prior reports: Connecticut.

Heart rot caused by Polyporus gilvus Schw.

+New York - found on a shade tree; Kingston, Ulster County, September 23. Collected by E. F. Guba. (Chupp)

Tar leafspot caused by Rhytisma acerinum Fr.

Connecticut (Clinton), New York (Chupp), +Florida (Weber).

Recent literature:

Jones, S. G. Life history of Rhytisma acerinum (Preliminary Account). Ann. of Botany, 37: 731-732. 1923.

Felty fungus caused by Septobasidium pedicillatum (Schw.) Pat.

+Florida - the fungus was smothering growing tops of young twigs; Gainesville, Alachua County. (Weber)

Leafspot and blight caused by Taphrina spp.

Report prepared by Anna E. Jenkins, Office of Plant Disease Survey and Pathological Collections.

Maple, sugar (Acer saccharum)

Apparently epiphytotic in certain localities in a number of states in 1922; identified from specimens sent to the Department in June 1922 from the following states:

Maine, Rockport - specimens submitted by W. J. Morse, Orono, Maine.

New Hampshire, Center Conway - from Charles Baird who describes the symptoms as follows: "The leaves of our fine trees show dark spots on them, then shrivel up, turn black and die, leaving the limbs entirely bare."

New York, Andover - from Bernice Nye who states: "We have one tree which is dying from some disease. Last year one tree died in the same manner. The tree leaves out and looks perfectly healthy, then after the leaves are partly grown they turn black and fall off. Two trees near this one are partly affected."

Pennsylvania - specimen submitted by L. O. Overholts.

Ohio, Antioch, Antioch College - from O. L. Inman who mentions the destructive nature of the disease.

Indiana, Centerville - from Ellen Ranch.

Collections of this fungus were made in May, July and August, 1923 at Walton, New York on both shade and forest trees. The disease was present on practically all of the trees examined.

This disease has also been found on earlier collections of maple leaves from three other states:

Michigan, Michigan Agricultural College, Lansing, July 7, 1894.
Georgia, Gap of Dick's Ridge, Whitfield County, July 27, 1900.
Missouri, Galena, Stone County, May 25, 1914.

Maple, Silver (Acer dasycarpum) = (*A. saccharinum*)

Michigan, Michigan Agricultural College, Lansing - determined from specimens collected by C. F. Wheeler, June 2, 1897.

Maple, Black (Acer nigrum)

Ohio, Antioch, Antioch College - determined from specimen received from O. L. Inman, June, 1922.

Maple, Red (Acer rubrum)

New York, Walton - collected on young trees, August 1, 1923.
Alabama, Notasulga - collected by George W. Carver, April 29, 1897.
North Carolina - F. Sherman Jr., May, 1901.

No record of Exoascaceae on any of the maples listed above has been found. The *Taphrina* spp. on sugar maple and on black maple are identical. This species is very similar to *Taphrina acericola* Massal. on *Acer campestre* from Italy and further study may reveal that they are the same. The species on silver and red maples are of two undescribed species, as far as known.

The following are the only two species described as occurring in America:

Taphrina lethifer (Pk.) Sacc. on *Acer spicatum*; specimens collected by C. H. Peck at Elizabethtown, Essex County, New York, June 1886.

Exoascus aceris Dearn. & Barth. on *Acer grandidentatum*, Parley's Canon, Salt Lake County, Utah,

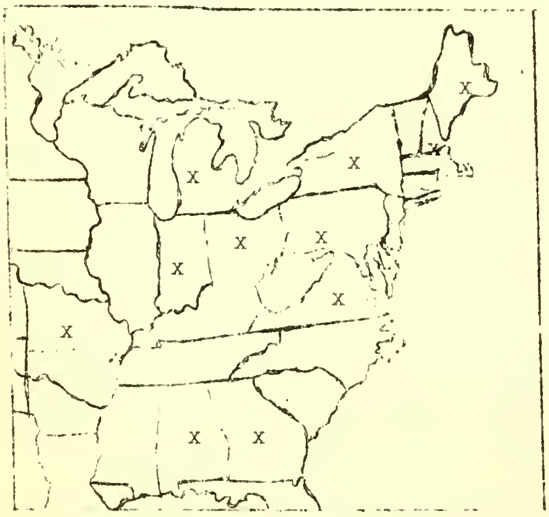


Fig. 15. Distribution of *Taphrina* spp. on *Acer* spp.

June 29, 1915 (Fung. Col. E. Barth. 5018). A specimen also on *Acer grandidentatum* from Bear Lake, Utah, July 6, 1908, collected by L. H. Pammel has been examined during the present study and found to be of this latter species.

The studies of the American Exoasceae on *Acer* spp. are being continued and will be reported in detail in a subsequent paper.

The accompanying map (Fig. 15) summarizes the distribution of *Taphrina* spp. on *Acer* spp.

Wilt caused by *Verticillium* sp.

"This disease was either noted or specimens received from North Carolina, Tennessee, West Virginia, Virginia, Maryland, Pennsylvania, District of Columbia, Connecticut, New York, Indiana and Wisconsin during 1923. It has been found in one nursery and if careful inspections were made of nurseries for this disease, it would probably be found in a number of nurseries. On nursery trees as well as on shade trees it is very difficult to detect the disease until some part of the tree or even the entire tree wilts." (G. F. Gravatt)

Flyspeck - cause undetermined

+New York - along each side of Laborador Lake; Onondaga County, May 19. (Chupp)

Chlorosis caused by too much lime.

Texas - (Taubenhaus)

Scorch caused by heat and drought.

Massachusetts - rather serious; much more than usual due to drought conditions throughout summer. (Osmun)

Connecticut - three reports. (Clinton)

New York - very important; statewide; in severe cases caused defoliation. (Chupp)

Indiana - reported from six counties. (Gardner)

Frost injury due to weather conditions.

Ohio - throughout state; the severe freeze of May 10 killed the leaves or seriously injured those in the bud. (Detmers)

Illinois - a great many complaints have been received concerning the leaf injury to maples during the spring; at Peoria, Springfield and Galesburg this was manifested by a dead area on the petiole about one inch below the blade; the area was localized, being about 3 mm. in length; in other cases the edges of the leaves were brown; caused by cold high winds on May 7 and 8 when snow fell in many localities. (Anderson)

Winter injury

Ohio - caused splitting of bark; throughout northern half of state. (Detmers)

OAK, POISON - See Sumac Poison

OAK, WHITE (*Quercus alba*) - See Canker, Quercus spp.

OAK, SWAMP WHITE (*Quercus bicolor*)

+Anthracnose caused by *Gnomonia veneta* (Sacc. & Speg.) Kleb.

New York - supposed to be a new host for state; Nassau County, June 10. (Chupp)

OAK, SCARLET (*Quercus coccinea*)

Rust caused by *Cronartium fusiforme* (Pk.) Hedgc. & Hunt.

+Ohio - abundant locally; state forest, Scioto County, September 25. (Detmers)

OAK, WATER (Quercus nigra) - See Oak - Leaf curl, Quercus spp.

OAK, PIN (Quercus palustris) See Oak - Canker, Quercus spp.

OAK, ENGLISH (Quercus robur)

Polyporus rubriporus Quelet

Recent literature:

Costantin, J. and L. Dufour. Une maladie secondaire du Chêne causee par le Polyporus (Phellinus) rubriporus. (The secondary disease of oaks caused by Polyporus rubiporus). Compt. Rend. Acad. Sci. Paris 177: 806-809.

OAK, COMMON RED (Quercus rubra)

Leaf blister caused by Taphrina coerulescens (Mont. & Desm.) Tul.

New York - Riverhead, Suffolk County, June 12; collected by Fernow. (Dept. Pl. Path.). Prior reports: Alabama, *Georgia, Iowa, New Hampshire and *New York.

OAK, BLACK (Quercus velutina)

+Heart rot caused by Polyporus gilvus Schw.

New York - the majority of black oaks along Cascadilla Gorge (Ithaca, Tompkins County) both above and below College Avenue Bridge are dying or badly affected apparently from this fungus; the black oaks on the campus are also affected; the white oaks show no injury. (Chupp)

Leaf curl - See Oak, Quercus spp.

OAK (Quercus spp.)

Mushroom root rot caused by Armillaria mellea (Vahl.) Quel.

+Delaware - very prevalent in Brandywine Park, Brandywine, New Castle County. (Adams)

+Wisconsin - at one place in Walworth County an acre of new growth was killed; it is undoubtedly throughout the hard wood regions of the state; it is mostly on smaller roots at some distance from the trunk (six feet); in advance cases rot occurs at crown and up under the bark; Armillaria mellea is probably the cause of the rot, at least it is apparently so, as it is always present. Notes from R. H. Colley. (Vaughan)

Prior reports: California, Massachusetts, Minnesota, Oregon and Washington.

Anthracnose caused by Gnomonia veneta (Sacc. & Speg.) Kleb.

Massachusetts - general throughout state; not serious this year. (Osmun)

+Florida - caused considerable spotting of leaves some of which are shed; not serious. (Weber). Prior reports: Connecticut, Delaware, *District of Columbia, Georgia, *Indiana, Iowa, Massachusetts, Michigan, Minnesota, New Jersey, *New York, Ohio and Wisconsin.

Powdery mildew caused by Microsphaera alni var. extensa (Cke. & Pk.) Salm.

New York - Quercus (rubra?), Enfield Gorge, Tompkins County, July 4. (Chupp)

Stem canker caused by Myxosporium sp.

Connecticut - this fungus was found on cankers of living twigs, but the parasitic nature not proved by inoculation. (Clinton)

Prior report: Alaska.

+Leafspot caused by Phyllosticta quercus Sacc. & Speg.

New York - Enfield Gorge, Tompkins County, July 4. (Chupp)

Heart rot of root and trunk caused by Polyporus spraguei Berk.

Recent literature:

Weir, James R. Polyporus spraguei Berk., cause of heart rot. Phytopath. 13: 288. 1923. Hosts infected were Quercus rubra, Q. prunus, Q. coccinea, Q. velutina, Q. marilandica and Castanea dentata.

Canker caused by Strumella coryneoidea Sacc. & Wint.

Connecticut - occasionally found on trees in woods; sometimes break off at cankers; +Quercus alba and +Quercus palustris hosts infected; Orange County, April. (Clinton).

Prior report: Connecticut.

Leaf blister caused by Taphrina coerulescens (Mont. & Desm.) Tul.

Connecticut - Storrs, New Haven County, July 28. (Clinton)

*New York - on Quercus velutina; Nassau County, June 9. (Chupp)

*South Carolina - Greer, Greenville County, July 4. (Ludwig). On Q. nigra; Lynchburg, May 15. Collected by E. D. Smith. (Jenkins)

Georgia - specimens received from several points in the state. (McHatton)

Florida - has caused considerable damage to water oaks (Quercus nigra) in Pensacola and St. Augustine; large trees were almost completely defoliated and the situation was indeed alarming; collected also at Gainesville but not of such a serious nature there. (Weber)

Alabama - general on host in forests and fields; caused anxiety in some cases by defoliating the water oak (Quercus nigra) grown for shade. (Miles)

Mississippi - Clarke County, May 22. (Neal & Barker)

Ohio - (A. E. Gravatt). Prior reports: *Alabama, Connecticut, *Delaware, *Florida, *Georgia, Iowa, *Massachusetts, *Mississippi, New Jersey, New York, North Carolina, Ohio, Oklahoma, Pennsylvania, South Carolina, *Texas and Virginia.

Recent literature on oak diseases:

Grintescu, J. Sur l'oidium du Chêne et sès périthéces. (The Oidium of the oak and its peritheoia). Bul. Soc. Stiinte Cluj, 13: 497-505. 1923.

Marie, P. Note complémentaire relative à une récente communication sur les effets néfastes de la secheresse de 1921 produits sur les chênes de certaines régions. (The injurious results of the dry summer of 1921 on oaks in some parts of France). Rev. Path. Vég. et Entomol. Agr. 10: 76-77. 1923.

Petri, Lionello. Sur la formation des chlamydospores chez l'Oidium des chênes. (Formation of chlamydospores in the Oidium in oaks). Congrès. Path. Vég. Strasbourg. 36-37. Imprimerie Alsacienne: Strasbourg. 1923.

Portal, M. The defoliation of oaks. Country Life 54: 124-126. July 1923.

Vanine, E. La pourriture annulaire du chêne, produite par le Vuillemina comedens Maire. (Annular rot of oak caused by V.

comedens). Rept. Internat. Conf. Phytopath. and Econ. Entomol. Holland 11: 263-264. 1923.

Williamson, Helen Stuart. The origin of 'Golden Oak.' Ann. Bot. 37: 433-444. 1923.

PEPPER TREE, CALIFORNIA (Schinus molle)

+Timber rot caused by Inonotus schini Brown

Arizona - causes rot of timber, a wilt and death of trees; Tucson, Pima County, July 16. (Brown)

PLUM, AMERICAN (Prunus americana)

Brown rot caused by Sclerotinia cinerea (Bon.) Schroet.

+New York - Tompkins County, May 15. (Chupp). Found on five varieties of this species causing fruit rot. (Kirby)

Prior report: *Mississippi.

Leaf scorch caused by weather

New York - in park at Rochester, Monroe County, September 21. (Chupp)

PLUM, HORTULAN (Prunus hortulana)

+Brown rot caused by Sclerotinia cinerea (Bon.) Schroet.

New York - found on two varieties of this species causing fruit rot; Tompkins County, October 9. (Kirby)

PLUM, WILDGOOSE (Prunus munsoniana)

+Brown rot caused by Sclerotinia cinerea (Bon.) Schroet.

New York - found on five varieties, Downing, Freestone, Goose, Newman and Arkansas; Tompkins County, October 9. (Kirby)

PLUM, CANADA (Prunus nigra)

+Brown rot caused by Sclerotinia cinerea (Bon.) Schroet.

New York - fruit rot on variety Cheney; Tompkins County, October 9. (Chupp)

PLUM, JAPANESE (Prunus salicina)

+Brown rot caused by Sclerotinia cinerea (Bon.) Schroet.

New York - found on six varieties, Red June, October, Ogon, Abundance, Burbank and Chabot, Tompkins County, October 9. (Kirby)

POPLAR, SILVER (Populus alba nivea)

+Canker caused by Dothichiza populea Sacc. & Br.

Connecticut - Fairfield (two reports) and New Haven (three reports) Counties. Reports are from Entomological Nursery Inspections. (Zappe)

POPLAR, SOUTHERN COTTONWOOD (Populus deltoides)

Rust caused by Melampsora medusae Thuem.

+New York - Tompkins County, September 14; period of greatest injury was in September. (Chupp). Prior reports: *Illinois, *Indiana, Iowa, *Mississippi, North Dakota, Oklahoma, *Texas, *West Virginia and *Wisconsin.

POPLAR, CAROLINA (Populus eugenei)

+Canker caused by Cytospora chrysosperma (Pers.) Fr.

Ohio - a serious invasion in a block of Carolina poplars on a plantation near Chillicothe, Ross County, June 15. Only report received so far of this disease in Ohio. (Detmers)

Canker caused by Dothichiza populea Sacc. & Br.

+Connecticut - Fairfield (Ridgefield, September 6) and Middlesex Counties. (Zappe). Prior report: Ohio.

Recent literature:

Detmers, Freda. Dothichiza canker on Norway poplar. Phytopath. 8: 245-247. 1923.

POPLAR, LOMBARDY (Populus nigra italica)

Canker caused by Dothichiza populea Sacc. & Br.

+Connecticut - thirty-four reports (from all counties except Tolland); chiefly from nursery inspectors; first report from New Haven, New Haven County, June 20.

New York - Bronx Gardens, New York, Bronx County, May 11. (Chupp)

+Maryland - (Hahn)

+Indiana - twigs and branches girdled and killed; Lafayette, Tippecanoe County, May 27. (Gardner)

Prior reports: *Illinois, *New York, Pennsylvania and Wisconsin.

Recent literature:

Anonymous. European black canker (Dothichiza populea). Tree Talk 3: 23. 1923.

+Yellow leaf blister caused by Taphrina aurea Fr.

Oregon - resulted in little, if any, injury to the host; Eugene, Lane County, June 19. (Boyce)

ASPEN, QUAKING (Populus tremuloides)

Canker caused by Cytospora chrysosperma (Pers.) Fr.

+Minnesota - several clumps of trees in Ramsey County found dead or dying on June 3. (Sect. Pl. Path.)

Prior reports: Arizona, *Colorado, Idaho, Montana, New Mexico, *New York, North Dakota, *Pennsylvania, South Dakota, Utah and *Wyoming.

Hypoxylon canker caused by Hypoxylon pruinatum (Klotsch) Cke.

Recent literature:

Povah, Alfred. Hypoxylon poplar canker. (Abstract) Phytopath. 12: 59. 1922. Cites disease found in Maine, New York and Michigan.

+Tar spot caused by Rhytisma sp.

Minnesota - (Sect. Pl. Path.)

POPLAR (Populus spp.)

*+Apiosporium salicinum (Pers.) Kze.

New York - Suffolk County, August 19. (Chupp)

Canker caused by Cytospora sp.

New Mexico - common. (Crawford)

Washington - Grant County. (Heald & Dana)

Canker caused by Cytospora chrysosperma (Pers.) Fr.

North Dakota - important in nurseries. (Weniger)

New Mexico - Lombardy very susceptible; appears to attack trees that are weakened in some way, as too little water or improperly pruned; State College, Dona Ana County, July. (Crawford)

Arizona - scattered over the state. (Brown)

Canker caused by Dothichiza populea Sacc. & Br.
Massachusetts - common. (Osmun), (Davis)
Ohio - severe locally, Ross County. (Detmers)
Minnesota - Beltrami County. (Sect. Pl. Path.)

Leafspot caused by Marssonia populi (Lib.) Sacc.
+Colorado - local; Fort Collins, Larimer County, September. (Learn)
Prior reports: Maryland, Massachusetts, New Hampshire and New Jersey.

Rust caused by Melampsora larici-populina Kleb.
+Oklahoma - Payne County, October 29. (Stratton)
+New Mexico - Dona Ana County. (Crawford)
Prior reports: *Connecticut, Iowa, Louisiana, Kansas, Maine, *Maryland, *Massachusetts, Minnesota, *Nebraska, New Jersey, New Mexico, *New York, North Dakota, Oklahoma, *Virginia, Washington and West Virginia.

+Root rot caused by Ozonium omnivorum Shear
Texas - prevalent; 1% reduction. (Taubenhaus)

+Mistletoe - Phoradendron flavescens (Pursh) Nutt.
New Mexico - common; very important; one of the chief causes for death of cottonwoods in the Mesilla Valley; very few trees free from infestation. (Crawford)

Hail injury
Pennsulvania - (Hahn)

Recent literature:
Foëx, E. Une maladie du Peuplier. (A disease of the Poplar). Rev. Hort. 95: 476-477. 1923.
Hiley, W. E. Fungus and bacterial diseases of Poplars. Great Britain Forest. Comm. Bul. 5: 47-50. 1923.

PRUNUS, AMERICANA - See Plum, Common Wild, also Brown Rot, Prunus spp.

PRUNUS, ANGUSTIFOLIA WATSONI - See Prunus spp., Brown Rot

PRUNUS, CERASIFERA - See Prunus spp., Brown Rot

PRUNUS, DEMISSA - See Cherry, Western Choke

PRUNUS, DUNBARII - See Prunus spp., Brown Rot

PRUNUS, GLANDULOSA - See Almond, Flowering

PRUNUS, HORTULANA - See Plum, Hortulan

PRUNUS, MARITIMA - See Prunus spp., Brown Rot

PRUNUS, MUNSONIANA - See Plum, Wild Goose

PRUNUS, NIGRA - See Plum, Canada

PRUNUS, ORTHOSEPALA - See Prunus spp., Brown Rot

PRUNUS, PENNSYLVANICA - See Cherry, Pin

PRUNUS, SALICINA - See Plum, Cherry

PRUNUS, SEROTINA - See Cherry, Black

PRUNUS, WATSONI - See Prunus spp.

PRUNUS, VIRGINIANA - See Cherry, Common Choke

PRUNUS SPP.

Brown rot caused by Sclerotinia cinerea (Bon.) Schroet.

New York - Kirby and Honey surveyed a park at Rochester, Monroe County, September 21, obtaining the following data:

Species	Amount of rot
P. americana	none
+P. cerasifera	moderate
+Hybrid of P. dunbarii, maritima and americana	heavy
+P. orthosepala	moderate
+P. angustifolia watsoni	moderate

(Chupp)

PYRUS SPP.

Fire blight caused by Bacillus amylovorus (Burr.) Trev.

New York - in a park survey made by Kirby and Honey at Rochester, Monroe County, September 22, the following data was obtained:

Species	Degree of infection
+P. betulaefolia (Birch leaf pear)	very heavy
+P. canescens	light
+P. heterophylla	light
+P. serotina culta (late pear)	trace

(Chupp)

REDBUD (Cercis sp.)

*+Leafspot caused by Ovularia cercidis S. Cam.

Missouri - appears to be scattered and inconspicuous; Osage City, Cole County. (Burrill)

REDWOOD (Sequoia sempervirens)

Albino

Recent literature:

Anonymous. Albino redwood shoots. Missouri Bot. Gard. Bul. 11: 90-92. 1923.

SASSAFRAS (Sassafras variifolium)

Nummularia microplaca B. & C.

*+North Carolina - Cashiers, Jackson County, October 5. Collected by George H. Hedgecock. Prior reports: *Ohio and *Virginia.

Leafspot caused by Pestalozzia sp.

+New York - Monroe County, September 21. (Chupp)

SUMAC, SMOOTH (Rhus glabra)

Leafspot caused by Cercospora rhoina Cke. & Ell.

*+Missouri - one of the worst attacks seen; Jefferson City, Cole County, July 29. (Burrill). Prior reports: Alabama, *District of Columbia, *Indiana, *Kansas, *Mississippi, *Nebraska, New Jersey and *Virginia

SUMAC, POISON IVY OR OAK (Rhus toxicodendron)

Rust caused by Uromyces toxicodendri Berk. & Rav.

*+New York - Suffolk County, June 21. (Chupp). Prior reports: *Arkansas, *Connecticut, *Illinois, *Indiana, *Iowa, *Kansas, *Louisiana, *Massachusetts, *Michigan, *Minnesota, *Mississippi, *Missouri, *Nebraska, *North Dakota, *Ohio, *South Carolina, *Tennessee, *Texas, *Vermont, *Virginia and *Wisconsin.

SUMAC, STAGHORN (Rhus typhina)

+Canker caused by Physalospora cydoniae Arnaud

New York - Chautauqua County, June 25. Collected by Kirby and Honey. (Chupp)

SYCAMORE (Platanus occidentalis)

+Leafspot caused by Cercospora sp.

Louisiana - common but not important; Baton Rouge, East Baton Rouge County, July. (Edgerton)

Anthracnose caused by Gnomonia veneta (Sacc. & Speg.) Kleb.

Massachusetts - serious locally. (Osmun)

New York - common everywhere; Nassau County, June 10. (Chupp)

Delaware - more prevalent than usual; Newark, New Castle County, May 29. (Adams)

Pennsylvania - heavy infections. (Hahn)

Alabama - general; some trees killed by repeated attacks. (Miles)

Ohio - seemed to be more prevalent and serious than usual in June. (Detmers)

Indiana - severe. (A. E. Gravatt)

Michigan - severe. (A. E. Gravatt)

Iowa - less than 1922. (Melhus)

Missouri - Callaway County. (Burrill). Prior reports: Alabama, Connecticut, Delaware, *District of Columbia, *Illinois, Indiana, Iowa, *Kansas, *Maryland, Massachusetts, Michigan, *Missouri, *New York, *Ohio, *Pennsylvania, *Texas and West Virginia.

Leafspot caused by Stigmina platani (Fckl.) Sacc.

*+Missouri - two collections made at Columbia which seem to be the first made there. (Maneval). Prior reports: *Arkansas, *California, *Georgia, *Illinois, *Mississippi, *Oklahoma and *West Virginia.

Canker probably due to winter killing

Wisconsin - cankers mostly on south side of young trees; Waterloo, Jefferson County, June 30. (Vaughan)

WALNUT, BLACK (Juglans nigra)

Anthracnose caused by Gnomonia leptostyla (Fr.) Ces. & DeNot. (Marssonia juglandis (Lib.) Sacc.)

New York - defoliates most of the trees in the state. (Chupp)

*+Minnesota - Wright County. (Sect. Pl. Path.) Prior reports: Alabama, *Arkansas, Connecticut, *Delaware, *Illinois, Indiana, Iowa, *Kansas, *Maryland, *Michigan, *Nebraska, New Jersey, North Dakota, Pennsylvania, *South Carolina, *Virginia, West Virginia and Wisconsin.

WILLOW (Salix spp.)

+Dodder - Cuscuta gronovii Willd.

New York - reported on Salix nigra; Onondago County, September 15. (Chupp)

Rust caused by Melampsora bigelowii Thuem.

+New York - reported on +Salix discolor, +S. lucida and +S. amygdaloides, Tompkins County, September 2. (Chupp)

Minnesota - Itasca County. (Sect. Pl. Path.)

Oregon - abundant; Homestead Inn, Hood River County. (Boyce)

Prior reports: *Colorado, Connecticut, Idaho, *Illinois, *Indiana, Iowa, *Kansas, *Michigan, Minnesota, *Montana, *Oregon, *Pennsylvania, *Tennessee, Texas, *Virginia, *Washington, West Virginia and *Wyoming.

Rust caused by Melampsora larici-capraearum Kleb. (M. salicis caprae Wint.)

+Oklahoma - Payne County, October 25. (Stratton)

Prior reports: Minnesota, Montana and Ohio.

Powdery mildew caused by Uncinula salicis (DC.) Wint.

New York - probably statewide; Tompkins County, August 18. (Chupp)

Iowa - (Melhus)

Oregon - abundant and sometimes caused premature leaf fall; Portland, Multnomah County, October 28. (Boyce). Prior reports: Connecticut, *Illinois, *Indiana, *Iowa, *Maine, Maryland, Massachusetts, *Michigan, *Minnesota, *Mississippi, *Montana, *New Hampshire, *New York, *North Dakota, *Ohio, *Oregon, *Vermont, *Virginia, Washington and *Wisconsin.

Canker - cause undetermined

Connecticut - similar to European canker but microscopical examination failed to verify the cause. (Clinton)

Flyspeck - cause undetermined

New York - reported on Salix discolor; Onondago County, September 10. (Chupp)

WOOD DESTROYING FUNGI

Wood rot caused by Polyporus schweinitzii Fr.

Minnesota - saprophytic on trunks of Picea mariana and Pinus resinosa and on the roots of Pinus divaricata. (Sect. Pl. Path.)

Wood rot caused by Polyporus anceps Pk.

Minnesota - very common wood rot of conifers. (Sect. Pl. Path.)

Rot caused by Poria incrassata (B. & C.) Burt.

Florida - during the past year the Plant Pathologist was called to St. Petersburg where a lumber company reported the loss of thousands of dollars worth of lumber because of a fungous organism which causes rot to timber. The fungus Poria incrassata) was found very prevalent in all parts of the large shed where it was destroying sawed boards, flooring, piles, joints, window-frames and building paper. To control this disease it was necessary to resaw all the lumber, put in a new concrete floor and thoroughly disinfect the entire establishment. (Weber)

Recent literature:

Humphrey, C. J. The destruction by the fungus "Poria incrassata" of coniferous timber in storage and when used in the construction of buildings. So. Lumb. Jour. 49: 36-37, 49-53. Feb. 1923.

________________ Decay of lumber and building timbers due to Poria incrassata (B. & C.) Burt. Mycologia 15: 258-277. Nov. 1923.

________________ The destruction by the fungus "Poria incrassata" of coniferous timber in storage and when used in the construction of buildings. Proc. Amer. Wood. Preser. Assoc. 19: 188-207. 1923.

HOUSE AND FURNITURE

Dry rot caused by Merulius lacrymans Fr.

Connecticut - one report from Wallingford, New Haven County, August. (Graves)

CONIFEROUS SEEDLINGS

Damping-off caused by Rhizoctonia solani Kuhn

Connecticut - isolated patches of seedlings here and there at Cheshire, New Haven County, were killed of white and red pines also white and blue spruce, July 7. (Clinton)

Recent literature:

Aullo, M. Resena fitopatologica forestal. (A survey of forest phytopathology in Spain). Rev. Fitopatologia (Madrid) 1: 9-11. 1923.

Bateman, E., and C. Henningsen. Theory of the mechanism of protection of wood by preservatives. Experiments with hydrocarbons. Proc. Amer. Wood Preservers' Assoc. 19: 136-144. 1923.

Boyce, J. S. Decays and discolorations in airplane woods. U. S. Dept. Agr. Bul. 1128: 51. 1923.

Charastelon, R. Sur un procede de conservation des bois. (On process for the preservation of wood). Compt. Rend. Acad. Sci. Paris 176: 1178-1179. 1923.

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Dodge, A. W. Diagnosing shade tree diseases. Tree Talk. 5^3: 7-9, 30. 1923.

Doé, Fr. L'öidium et le traitement des forests feuillues du nord-est de la France. Rev. Eaux et For. 61: 429-436. Oct. 1923.

Gerry, Eloise. Five molds and their penetration into wood. Jour. Agr. Res. 26: 219-230. 1923.

Haasis, F. W. Root rot as a factor in survival. Amer. Jour. of Forestry 21: 506. 1923.

Hammarlund, Carl. Boletus elegans Schum. und Larix-mykorrhiza. Bot. Not. 4: 305-326. 1923.

Jennings, O. E. The relation of smoke, fumes and dust to the vegetation of the industrial district of Pittsburgh. Trillia. 7: 27-38. Oct. 1923.

Hansen, T. S., W. H. Kenety, G. H. Wiggin, and E. C. Stakman. A study of the damping-off disease of coniferous seedlings. Minnesota Agr. Exp. Sta. Tech. Bul. 15: 35. Apr. 1923.

Harvey, R. B. Cambial temperatures of trees in winter and their relation to sun scald. Ecology 4: 261-265. July 1923.

Humphrey, C. J. Decay of poles and the fungi which cause it. Rept. Special Comm. on Wood Preservation. Amer. Electric Railway Engineering Assoc. 312: 52-69. Amer. Elec. Railway Assoc. New York. 1923.

Korstian, C. F. Control of snow molding in coniferous nursery stock. Jour. Agr. Res. 24: 747. June 1923.

Laubert, R. Ueber besonders heftiges Auftreten einiger Fruhjahrskrankheiten von Ziergehölzen in Jahre 1923. (The particularly severe occurrence of some spring diseases of ornamental trees in the year 1923). Gartenwelt, 27: 222-224. 1923.

M___________, F. A. The decay of structural timber, its causes and prevention. Bul. Bur. Biotechn. Leeds. 2: 7-20. Mar. 1923.

Rathbun, Annie E. Damping-off of taproots of Conifers. Phytopath. 8: 385-390. 1923.

Rhoads, A. S. The formation and pathological anatomy of frost rings in conifers injured by late frosts. U. S. Dept. Agr. Bul. 1131: 1-15. Feb. 1923.

Richards, C. Audrey. Methods of testing the relative toxicity of wood preservatives. Proc. Amer. Wood Preservers' Assoc. 19: 127-135. 1923.

Rogers, W. E. Resistance of trees to ice storm injury. Torreya. 23: 95-99. Nov. - Dec. 1923.

Schmitz, H. Notes on wood decay. The wood destroying properties of Polyporus volvatus. Amer. Jour. of Forestry, 21: 502-503. 1923.

___________ Studies in wood decay. Physiological specialization in Fomes pinicola Fr. (Abstract) Phytopath. 13: 511. 1923.

Sharples, A. Final report on treatment of mouldy rot disease with agrisol. Malayan Agr. Jour. 11: 36-37. Feb. 1923.

Snell, W. H. The effect of heat upon the mycelium of certain structural timber-destroying fungi within wood. Amer. Jour. of Botany 10: 399-412. 1923.

___________ The effect of heat upon wood destroying fungi in mills. Proc. Amer. Wood. Preservers' Assoc. 18: 25-32. 1922.

Soule, Roland P. Low temperature tars and wood preservation. Proc. Amer. Wood Preservers' Assoc. 19: 114-127. 1923.

Stakman, E. C. Fungi causing damping-off of coniferous seedlings in Minnesota. Minnesota Sta. Tech. Bul. 15: 29-35. 1923.

Toumey, J. W., and Ernest J. Neethling. Some effects of cover over coniferous seedbeds in southern New England. Yale Univ. School of Forest. Bul. 9: 1-39. 1923.

Vanin, S. T. Pests of forest trees in the different plantations of the Romanoff Forestry Area of the government of Tamboff in 1918. 'Plant diseases', Jour. Centr. Phytopath. Stat. Chief Bot. Gard. Russian Republic 11: 9-23. 1922.

Vanine, E. Essai d'valuation des pertes causées forestìeres auxé espèces par les champignons parasitès. (Losses caused by parasitic fungi on forest trees). Rept. Internat. Conf. Phytopath. and Econ. Entomol. Holland 258-262. 1923.

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Vaughan, Ira. Sick trees saved. Tree Talk. 5: 14-18. 1923.

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__________ *Polyporus spraguei* Berk., cause of heart rot. Phytopath. 8: 288. 1923.

__________ The genus Polystictus and decay of living trees. Phytopath. 8: 288. 1923.

__________ The effect of broadcast burning of sale areas on the growth of cull-producing fungi. Jour. of Forestry 21: 183-184. 1923. Review of Applied Mycology, Imperial Bureau of Mycology 2: 529-592. Dec. 1923.

Anonymous. Current topics. Nature 111: 679. 1923. The director of the Botanic Gardens at Kew has called the attention of the House of Commons to the damage likely to result from smoke. "There can be no doubt that heavy deposits of soot such as are borne by the evergreens at Kew are clear indication of atmospheric contamination which will markedly lower the vitality of the plants in the Gardens and in some cases may actually prevent their successful cultivation." At present the greatest damage probably arises from reduction of light.

DISEASES OF ORNAMENTALS

AMPELOPSIS or VIRGINIA CREEPER (Ampelopsis quinquefolia)

+*Leafspot* caused by *Pestalozzia* sp.

Florida - caused partial defoliation and stunting of vines in vicinity of Gainesville. (Weber)

Powdery mildew caused by *Uncinula necator* (Schw.) Burr.

New York - Wyoming County, August 24. Collected by E. F. Guba. (Chupp)

Delaware - observed locally and usually prevalent as the mildew on lilac. (Adams)

Prior reports: *Colorado, Connecticut, Delaware, *District of Columbia, *Illinois, *Indiana, Iowa, *Kansas, Maryland, *Massachusetts, Minnesota, Missouri, *Nebraska, *New Jersey, *New York, *North Dakota, *Ohio, *South Dakota, *Vermont and West Virginia.

AMPELOPSIS (Ampelopsis spp.)

Leafspot caused by *Guignardia bidwellii* (Ell.) Viala & Ravaz.

Has been found on *Ampelopsis quinquefolia* and *Ampelopsis tricuspidata* in Connecticut, *Delaware, District of Columbia, Illinois, Indiana, Iowa, *Kansas, Maryland, Massachusetts, Minnesota, Nebraska, New Jersey, *New York, *North Carolina, North Dakota, Ohio, Pennsylvania, Rhode Island, Texas, *Virginia and West Virginia.

ASPARAGUS FERN (Asparagus plumosus)

Blight caused by *Fusarium* sp.

Florida - important; nature of injury is a blighting and shedding of leaves, Altamonte Springs, Seminole County, September 1. (Foster)

Phoma sp.

Florida - occasionally reported to be very severe in nurseries. (Weber)

ASPIDISTRA (Aspidistra sp.)

Leafspot caused by Colletotrichum omnivorum Halst.

+Missouri - found in the greenhouse of the horticultural department of the College of Agriculture, Columbia, Boone County. (Maneval). Prior report: *Pennsylvania.

ASTER (Callistephus chinensis)

Wilt caused by Fusarium conglutinans var. callistephi Beach

New York - very important causing a 1 to 3% reduction in yield; as high as 25% infection found in individual plots; probably statewide in distribution; probably same as was described in Ohio as Fusarium incarnatum Wallenw., at least the symptoms are the same. (Chupp)

Illinois - less than previous year; important wherever it occurs; about 5% of plantings in state are affected; 1% reduction in yield, Bureau and Tazewell Counties. (Tehon)

Michigan - Niles, Berrien County, June 28. (Coons)

Minnesota - severe in some fields and greenhouses in Ramsey County. (Sect. Pl. Path.)

North Dakota - common in eastern and central parts; probably general over state; a limiting factor in asters growing in garden plots, Colgate, Steele County, August 6. (Weniger)

+Kansas - Topeka, Shawnee County, August 1 (Stokdyk); Ramsey, Riley and Shawnee County. (White)

Prior reports: Idaho, Illinois, Indiana, *Michigan, Minnesota, New Hampshire, New York, North Dakota, Ohio, Oregon, Vermont, Washington and West Virginia.

Wilt caused by Fusarium sp.

New Jersey - severe in some gardens, Atlantic City, Atlantic City County, July 11. (Sect. Pl. Path.)

Delaware - Wyoming, Kent County, August 29. (Adams)

Florida - was very severe in isolated places in state. (Weber)

Indiana - Tippecanoe County. (Gardner)

Ohio - of considerable importance; about 90% of plantings in state were infected; early varieties most susceptible; Comet variety somewhat resistant; of general range throughout state; Delaware County, May 5. (Young)

Idaho - fairly common. (Hungerford)

Leafspot caused by Septoria callistephi Gloyer

New York - not important; a trace of loss, Cayuga County, June 10. In Monroe County, Newhall reports as follows:

"Abundant on 40 varieties in the seedbeds, quite severe, may be 15 to 20%. Rain first week in June. Seed was known to have pycnidia on it and was treated one-half hour in formaldehyde but seed of asters float and are hard to wet." (Chupp)

*+Ohio - Summit County, June 18. (Young)

Prior reports: Illinois, Michigan and *New York.

Leafspot caused by Septoria sp.

+Delaware- general in state; some plantings in home gardens showed severe defoliation, Wyoming, Kent County, August 29. (Adams)

Prior report: *Alabama.

+Anthracnose caused by Colletotrichum sp.

Florida - was reported from Tampa, the only instance in the state. (Weber)

Root knot caused by Heterodera radicicola (Greef.) Muell.
+Washington - Pierce County. (Heald & Dana).
Prior report: Connecticut.

Stem blight caused by Botrytis sp.
+Pennsylvania - Fayette County. (Thurston)
Prior report: Connecticut.

Mosaic cause unknown
+California - on occasional plant, Santa Ana, Orange County, September 3. (Harter & Weimer). Prior report: Minnesota.

Yellows cause unknown
New York - important locally, loss trace to 1%; Honey and Kirby found one bed in Monroe County with 100% infection; Tompkins County, September 20. (Chupp)

Delaware - most important disease affecting this plant; greater prevalence observed on the lighter types of soils; affected plants show retarded growth on sandy soils, especially during drought periods. (Adams)

Washington - Pierce County. (Heald & Dana)

Prior reports: *California, Connecticut, Delaware, Idaho, Maine, *Maryland, Massachusetts, Minnesota, New Hampshire, *New Jersey, New York, Pennsylvania, Rhode Island, Vermont, Virginia, Washington and Wisconsin.

Recent literature:
Kunkel, L. O. Insect transmission of aster yellows. (Abstract) Phytopath. 14: 54. Jan. 1924.

Miscellaneous.
Recent literature:
Gloyer, W. O. Fungous diseases of the China aster. (Abstract) Phytopath. 14: 64. Jan. 1924. Diseases cited are Ascochyta asteris (Phyllosticta asteris Bres.), Botrytis cinerea, Coleosporium solidaginis, Fusarium sp., Phytophthora sp., Rhizoctonia solani, and Septoria callistephi.

AZALEA (Azalea spp.)

+Dodder - Cuscuta sp.
South Carolina - on A. formosa; unimportant, Summerville, Dorchester County, October 15. (Ludwig)

Gall caused by Exobasidium azaleae Pk.
+Florida - one report, leaves infected. (Weber)
Prior report: Alabama.

Gall caused by Exobasidium vaccinii (Fckl.) Wor.
+Louisiana - Baton Rouge, East Baton Rouge County, May 8. (Edgerton)
Prior reports: *Alabama, Connecticut, *District of Columbia, *Georgia, *Illinois, New Jersey and *South Carolina.

Gall caused by Exobasidium sp.
South Carolina - Dorchester (Summerville, April 12) and Sumter Counties. (Ludwig). Prior report: Connecticut.

Powdery mildew caused by Microsphaera alni (Wallr.) Wint.
+New York - observed in a park at Rochester, Monroe County, September 21 on the following species: +Azalea gandavensis (this species most heavily infected), +A. mollis, +A. pontica and +A. esmeralda.
Prior report: Connecticut.

Damping-off cause unknown
Massachusetts - (A. E. Gravatt)

BAMBOO

Bacterial leafspot cause undetermined

Florida - was very common on bamboo leaves; the plants became partially defoliated from the results of the disease. (Weber)

Rust caused by *Puccinia melanocephala* Syd.

Florida - reported from three different localities in the state exclusive of Jacksonville where it was collected in 1922; wherever it was collected the infection was quite general. (Weber)

BARBERRY (Berberis spp.)

Leafspot caused by *bacteria*

New York - notes on barberry infection made by R. S. Kirby at Rochester, June 9. The following species showed from 2 to 5% of the leaves infected: *Berberis amurensis japonica*, *B. sargentiana*, *B. subcauliata*, *B. thunbergi*, *B. verruculosa*, *B. vulgaris*, *B. weichangensis* and *B. yunnanensis*.

Idaho - wherever Barberries are grown. (Hungerford)

Rust caused by *Puccinia graminis* Pers.

New York - Notes on barberry infection made by R. S. Kirby at Rochester, June 9. The various species are marked as follows:

Trace (one or two infected leaves) on *Berberis angulosa* and *B. fendleri*.

Light (4 or 5 leaves infected) on *Berberis declinata oxyphulla*, *B. liechlinii*, *B. oblonga* and *B. sinensis*.

Moderate (2 to 5% leaves infected) on *Berberis alesuthensis*, *B. amurensis japonica*, *B. durobrivensis*, *B. emarginata*, *B. fuchsoides*, *B. meihanii*, and *B. subcauliata*.

Heavy (over 15% of leaves infected) on *Berberis amurensis*, *B. aristata*, *B. canadensis* and *B. emarginata britzensis*.

Berberis vulgaris had over 90% leaves infected; infection found on nearly every bush in state; Owego, Tioga County, May 6.

No infection on *Berberis aggregata*, *B. brachypoda*, *B. brevipaniculata*, *B. buxifolia*, *B. concinna*, *B. coryi*, *B. cratagine*, *B. crataegoides*, *B. dasystachya*, *B. diaphana*, *B. francisci-ferdinadi*, *B. gilgiana*, *B. jamesonii*, *B. koreana*, *B. poireti*, *B. pratti*, *B. sargentiana*, *B. serrata*, *B. stenophylla*, *B. swasey*, *B. thunbergi*, *B. virescens*, *B. wilsonae*, *B. yunnanensis*, *Mahonia aquifolium* and *M. repens*.

BEGONIA (Begonia sp.)

Anthracnose caused by *Gloeosporium begoniae* Magn.

+Florida - resulted in a complete girdling of the stem and collapse of the plant; Palatka, Putnam County. (Weber)

Root knot caused by *Heterodera radicicola* (Greef.) Muell.

Ohio - galls formed on roots; Champaign County, January 23. (Detmers). Prior reports: Indiana and Nebraska.

BERBERIS SPP. - See Barberry

BOSTON IVY - See Ampelopsis tricuspidata

BOX (Buxus sempervirens)

Leafspot caused by Macrosphoma candollei (Berk. & Br.) Berl. & Vogl.

New Jersey - Riverton, Burlington County, September 15. (Dept. Pl. Path.). Prior reports: *District of Columbia, Maryland, *Mississippi, New Jersey, *New York, *North Carolina, *Pennsylvania, *Texas and *Virginia.

+Leafspot caused by Phyllosticta sp.

*New York - Mineola, Nassau County, August 6. (Chupp)

Blight cause unknown

Mississippi - many hedges in state affected, causing the plant to frequently die; apparently of general range; enlarged lenticels are quite noticeable; disease possibly caused by excessive moisture or poor drainage; was reported May 1 from Forest County and was later reported from several sections of the state. (Neal & Barker)

BUDDLEIA- See Butterflybush

BUTTERFLYBUSH (Buddleia sp.)

+Root knot caused by Heterodera radicicola (Greef.) Muell.

Mississippi - one report; serious; Tunica County, April 27. (Neal & Barker)

CALENDULA (Calendula sp.)

Rust caused by Puccinia recedens Syd.

*+Kansas - occurred in 1922 in the college green houses but was not reported; it re-occurred during the winter of 1922-23 in the same bench; determination made by J. C. Arthur; the rust has not been found outside of the greenhouse although Calendula plants have been examined in the neighborhood. (White)

Prior report: Illinois.

Recent literature:

Perotti, R. and G. Zaffuto. Sui bacilli radicali della Calendula officinalis L.) Rendic. Acad. Lincei 32: 94-98. 1923.

CALLA (Zantedeschia sp.)

Leafspot caused by Cercospora callae Pk. & Clint.

+New York - Tompkins County, August 11. Collected by E. E. Honey. (Chupp). Prior reports: *Massachusetts and *Wisconsin

CAMELLIA (Camellia japonica)

Leafspot caused by Pestalozzia guepini Desm.

+Alabama - ranges throughout southern counties; severe in a number of nurseries; in these cases the salability of the plants were reduced. (Miles). Prior reports: *Louisiana, *Mississippi, *New York and *Pennsylvania.

CANNA (Canna indica)

+Rust caused by Puccinia cannae (Wint.) P. Henn.

Florida - the rust was well scattered over the plants, killing the older leaves, St. Petersburg, Pinellas County. (Weber)

CARNATION (Dianthus caryophyllus)

Alternariose caused by Alternaria dianthi Stev. & Hall

Connecticut - one report; reported only once before; the Enchantress Variety was so badly injured that the crop in the greenhouse was a partial failure, New Haven, New Haven County, November 28. (Clinton)

Prior reports: Connecticut, Maryland, Minnesota, New York, *North Carolina and Pennsylvania.

+Bacterial spot caused by Bacterium woodsii EFS.

Oklahoma - Payne County, November 4. (Stratton)

Wilt caused by Fusarium incarnatum (Desm.) Sacc.

+Florida - reported from various localities by florists; it caused a wilting and final destruction of the plant; was of much importance in isolated instances. (Weber)

Prior report: Indiana.

Root rot caused by Rhizoctonia sp.

New York - Cortland County, June 3. Collected by R. S. Kirby. (Chupp)

Prior reports: Connecticut, Delaware, Idaho, Indiana, Maryland, Massachusetts, New Jersey, *New York, North Carolina, Ohio, *Pennsylvania and Washington.

Rust caused by Uromyces caryophyllinus (Schrank) Wint.

Connecticut - one report, Danberry, Fairfield County, January 27. (Clinton)

New York - Bronx County, May 12.
Niagara County - one greenhouse with 95% infection
Erie County - one greenhouse with 30% infection
Bronx County - trace in greenhouse
Cortland County - trace in greenhouse
Broome County - trace in greenhouse
Tompkins County - epidemic in college (Chupp)

+Florida - was collected at Gainesville and Jacksonville the only places reported in the state. (Weber)

Mississippi - one report; heavy infection in greenhouse, April 30, Washington County; this disease probably occurred elsewhere in greenhouses; it is frequently very serious. (Neal & Barker)

Ohio - is of considerable importance; the malformation of leaves reduced the vigor of the plant; found in greenhouses where ventilation is not very good; Cuyahoga, Erie, Franklin and Wayne Counties. (Detmers)

Indiana - common in greenhouses; inconspicuous in summer, bad in winter, Tippecanoe County. (Gardner)

Illinois - light infection reported in small beds near Monmouth, Warren County, and 50% in greenhouses near Galesburg, Knox County. (Tehon)

*+Missouri - Boone, Buchanan, Butler, Jackson, Newton, and St. Louis Counties. (Maneval)

Colorado - confined to greenhouse conditions; Ft. Collins, Larimer County, March. (Learn)

Prior reports: Alabama, *California, Connecticut, Delaware, *District of Columbia, Idaho, *Iowa, *Kansas, Kentucky, *Maine, Maryland, *Massachusetts, *Michigan, Minnesota, *Mississippi, Nebraska, Nevada, New Jersey, *New York, North Carolina, *Ohio, Oklahoma, Oregon, *Pennsylvania, *South Carolina, South Dakota, *Texas, Utah, *Vermont, Washington and West Virginia.

White tip caused by fumigation injury

Connecticut - one report; Danbury, Fairfield County, January 27. (Clinton)

CHRISTMAS ROSE (Helleborus niger)

Leafspot caused by Coniothyrium hellebori Cke. and Mass.

+New York - Monroe County, September 19. (Chupp).

Prior report: *Oregon.

Chrysanthemum (Chrysanthemum sp.)

Powdery mildew caused by Erysiphe cichoracearum DC. (Oidium chrysanthemi)

+New York - frequent on young plants in greenhouses; Genesee County, August 22. (Chupp)

+New Jersey - severe, Mrs. Voight; medium, Baby, Elberon, Percy Dove; slight, Marigold, C. Twigg, H. V. West; none, Wm. Turner, Yellow Turner, Chieftain. (Haenseler). Reported from Patterson, Passaic County, October 12. (Dept. Pl. Path.)

Delaware - observed only in greenhouses and less prevalent than in 1922. (Adams)

Prior reports: Delaware, Maryland, *Massachusetts, Minnesota, Nebraska, North Carolina, Ohio, Pennsylvania, South Carolina, Utah, and West Virginia.

Wilt caused by Fusarium sp.

+Florida - local distribution; of no economic importance. (Weber)

Alabama - locally important, Mobile County. (Miles)

+Kansas - of slight importance; reported only from greenhouses at Independence, Montgomery County. (White)

Has been found also in Massachusetts, New Jersey and Ohio.

Root gall caused by Heterodera radicicola (Greef.) Muell.

+Washington - Spokane County. (Heald & Dana)

Prior report: *Texas.

Leafspot caused by Phyllosticta chrysanthemi Ell. & Desm.

+Florida - caused the defoliation of plants just before blossoming time; was widely scattered over the plants; severe, the host plants being killed; Gainesville, Alachua County. (Weber)

Prior report: Massachusetts.

Leafspot caused by Septoria chrysanthemella Cav.

Prior reports: Connecticut, Delaware, Georgia, Maryland, Massachusetts, Minnesota, Mississippi, Nebraska, New Jersey, North Carolina, Oklahoma, Pennsylvania, South Carolina, Texas and West Virginia.

+Wilt caused by Verticillium albo-atrum Reinke & Berth.

New Jersey - causes a dwarfing with slow wilting and the dying of the leaves from the base upward; it attacks the host at all stages of growth and caused injury throughout the season; noted in 13 varieties in greenhouses and outdoors during the past six years; Pink Seidewich, Early Snow and P. A. Dove very susceptible; artificial inoculation with V. albo-atrum successful. (Haenseler)

Recent literature:

Chifflot, Jean. Maladies et parasites des boutures de chrysanthemes. (Diseases and parasites of chrysanthemum cuttings). Congres Path. Veg. Strasbourg, 42-44. Imprimerie Alsacienne: Strasbourg, 1923.

Goodey, T. A. A review of the plant parasitic members of the genus Aphelencus . Jour. Helminthol. 1: 143-156. Sept. 1923. Cites the following: Described in 1911; Aphelenchus ritzema-bosi Schwartz (A. phyllophagus

Stewart, 1921); Endoparasitic in leaves of chrysanthemums causing destruction and discoloration of leaf tissue.

Sandground, J. A note on the occurrence of Aphelenchus phyllophagus in chrysanthemums in the Transvaal, with suggestions for its control. So. African Jour. Sci. 19: 233-235. 1922.

CLEMATIS (Clematis sp.)

Root knot caused by Heterodera radicicola (Greef.) Muell.

+Oregon - Oranco, Washington County. (Heald & Dana)

Prior reports: Alabama, Ohio and Washington.

CRAPEMYRTLE (Lagerstroemia indica)

+Leafspot caused by Pestalozzia guepini Desm.

Florida - resulted in the defoliation of severely infected plants; in general the disease was not serious although it was widespread. (Weber)

CROCUS, SAFFRON (Crocus sativus)

Bacterial rot caused by Bacterium croci Mizusawa

Recent literature:

Mizusawa, Y. A bacterial rot disease of saffrons. Ann. Phytopath. Soc. Japan 1: 1-12. 1923.

CYCLAMEN (Cyclamen sp.)

+Black root rot caused by Thielavia basicola (B. & Br.) Zopf.

Connecticut - new host to Connecticut; one report from New Haven, New Haven County, February. (McCormick)

CYDONIA, JAPONICA (Japanese Quince)

+Fire blight caused by Bacillus amylovorus (Burr.) Trev.

Michigan - severe. (A. E. Gravatt)

DAHLIA (Dahlia sp.)

Powdery mildew caused by Erysiphe polygoni DC.

+Delaware - more generally prevalent in New Castle County following heavy rains in September. (Adams)

+California - common, Santa Ana, Orange County, September 5. (Harter & Weimer)

Prior reports: Georgia and Missouri, while Erysiphe sp. has been reported from Iowa, Maryland and North Carolina.

Wilt caused by Fusarium sp.

New Jersey - New Brunswick, Middlesex County, November 24. (Dept. Pl. Path.)

Pennsylvania - caused a head blight; Washington County. (Thurston)

Leafroll and mosaic - cause not determined

+Delaware - symptoms similar to leaf roll and mosaic on potatoes; becoming of increasing importance; many gardeners are destroying the roots of affected plants thereby reducing the distribution of the disease. (Adams)

Sclerotinia libertiana Fckl.

Recent literature:

Cook, M. T. A disease of dahlias. Phytopath. 13: 285. June 1923.

DAISY

Southern blight caused by Sclerotium rolfsii Sacc.

Mississippi - one report, Washington County, June 30. (Neal & Barker)

DAISY, MICHAELMAS (Aster tradescanti)

Wilt caused by Cephalosporium asteris Dowson

Recent literature:

Dowson, W. J. Contributions from the Wisley Laboratory. The wilt disease of Michaelmas daisies. Jour. Roy Hort. Soc. 48: 38-57. 1923.

DAISY, PARIS - See Marguerite

DAISY, SHASTA (Chrysanthemum maximum hor. var.)

+Leafspot caused by Septoria sp.

California - Santa Ana, Orange County, September 5. (Harter & Weimer)

DELPHINIUM (Delphinium sp.)

Bacterial spot caused by Bacterium delphinii (EFS.) Bryan

Connecticut - two reports; one serious Hartford (Hartford, June 16) and New Haven Counties. (Clinton)

Prior reports: Connecticut, *Maine, *Massachusetts, *New York and Pennsylvania.

+Sclerotial disease caused by Sclerotium delphinii D. S. Welch

Recent literature:

Welch, D. S. A sclerotial disease of cultivated delphinium. (Abstract) Phytopath. 14: 31. 1924. Cites that this disease has been found in New York, Pennsylvania, Indiana and New Jersey.

Southern wilt caused by Sclerotium rolfsii Sacc.

+Florida - caused the loss of host plants by girdling the stem at the soil surface, St. Augustine, St. Johns County. (Weber)

Prior reports: *District of Columbia, *Illinois, *Indiana, *Louisiana and *New Jersey.

Wilt or drop caused by Sclerotium sp.

New York - frequently plants are killed; Genesee, Monroe (August 21) and Wyoming Counties. (Chupp)

Prior reports: Connecticut and *Maryland.

*+Volutella sp.

District of Columbia - Department of Agriculture grounds. (Jenkins)

Black blight or mosaic - cause unknown

New York - Massey reports that 50% of the crop in a mixed commercial planting was injured; estimated loss was about $900, June 10. (Chupp)

Rust - cause not determined

Ohio - one specimen of Delphinium reported to be affected with rust showed a dying of leaves, but no definite pathogenic organism could be detected, Rocky River, Cuyahoga County, August 15. (Young)

DELPHINIUM, HARDY (Delphinium formosum)

+Powdery mildew caused by Erysiphe polygoni DC.

New York - found in University Perennial Gardens; Ithaca, Tompkins County, September 8. (Chupp)

DEUTZIA (Deutzia sp.)
+Root knot caused by Heterodera radicicola (Greef.) Muell.
+Mississippi - one report; severe local infection in nursery; Covington County, May 11. (Neal & Barker).

EUONYMUS (Euonymus sp.)
Leafspot caused by Exosporium concentricum Heald & Wolf
Texas - prevalent; reported from six counties in eastern half of state. (Taubenhaus)
+Anthracnose caused by Gloeosporium frigidum Sacc.
Mississippi - general throughout state; causes a rather serious spotting of leaves; Covington County, May 15. (Neal & Barker)
Powdery mildew caused by Microsphaera euonymi (DC.) Sacc.
+Mississippi - one report; light infection; Coahoma County. (Neal & Barker). Prior report: New Jersey.
*+Mildew caused by Oidium euonymi-japonica (Arc.) Sacc.
Louisiana - apparently only occurs in the Shreveport section of the state; Belcher, Caddo County, May 25. (Edgerton)
Root rot caused by Ozonium omnivorum Shear
Texas - prevalent; caused about 5% loss. (Taubenhaus)

FALSE, DRAGONHEAD - See Physostegia

FERN, CHRISTMAS (Polystichum acrostichoides)
Taphrina filicina Rostr. (Exoascus filicinus (Rostr.) Sacc.
*Virginia - near Chain Bridge, Fairfax County, May 19. Collected by A. E. Jenkins. (Jenkins).
Prior reports: *District of Columbia, *Maryland and *North Carolina.

FERN, COMMON SWORD or BOSTON (Nephrolepis exaltata)
+Anthracnose caused by Glomerella nephrolepis Faris
Recent literature:
Faris, J. A. Anthracnose of the Boston fern. Mycologia 15: 89-95. Mar. 1923. Tentatively called Glomerella nephrolepis. The article cites that this disease was first observed at the Brooklyn Botanic Garden, New York, in 1919.

FLOWERING QUINCE - See Cydonia japonica

FORSYTHIA, FORTUNE (Forsythia suspensa var. fortunei)
+Winter injury
New York - E. E. Honey reported that a row of plants on the south side of a house along a terrace showed considerable injury; Ithaca, Tompkins County. (Chupp)

FORSYTHIA (Forsythia sp.)
+Crown gall caused by Bacterium tumefaciens EFS. & Town.
Mississippi - one report; slight; Covington County, May 11. (Neal & Barker)
+Root knot caused by Heterodera radicicola (Greef.) Muell.
Mississippi - one report; heavy infection in nursery; Covington County, May 11. (Neal & Barker)

FUNKIA (Hosta sp.)

+Leafspot caused by Alternaria sp.

New York - general; Dutchess County, August 23. (Chupp).

Prior report: Michigan.

GERANIUM (Pelargonium sp.)

Bacterial leafspot caused by Bacterium erodii I. M. Lewis

+Mississippi - widespread over the state; caused serious damage. (Neal & Barker)

Indiana - one report; Elkhart, Elkhart County, July 21. (Gardner)

Prior reports: Indiana, *New Jersey, Ohio, *Pennsylvania and Washington.

Bacterial leafspot caused by Bacterium pelargoni N. Brown

Recent literature:

Brown, N. A. Bacterial leafspot of Geranium in the eastern United States. Reprint from Jour. Agr. Res. 23: 361-372. 1923. Occurs in various parts of eastern United States from Virginia to Massachusetts. Especially prevalent and destructive in New Jersey and Maryland; mostly in the greenhouse; not the same as Bacterium erodii Lewis, described from Texas in 1914.

Wilt caused by Bacterium sp.

+Florida - common but not severe; caused the death of geraniums near Tampa and Plant City, Hillsborough County. (Weber)

Blackleg of cuttings caused by Pythium debaryanum Hesse

Recent literature:

Buddin, W. and E. M. Wakefield. Blackleg of Pelargonium cuttings. Gard. Chron. 75: 25. Jan. 12, 1924.

GLADIOLUS (Gladiolus sp.)

+Bacterial blight caused by Bacterium gummisudans McC.

Michigan - Ovid, Clinton County. (McCulloch)

Recent literature:

McCulloch, L. A bacterial blight of gladioli. Jour. Agr. Res. 27: 225-230. Jan. 1924.

Bacterial rot caused by Bacterium marginatum McC.

Recent literature:

McCulloch, Lucia. Two bacterial diseases of gladiolus. (Abstract) Phytopath. 14: 63. Jan. 1924.

Fusarium spp.

New York - a rot of corms; affected 2% of the plants in a small planting. (Massey)

+New Jersey - caused a wilt; New Brunswick, Middlesex County, September 29. (Dept. Pl. Path.)

Ohio - forms a scab on the corm which impairs vigor; seems to develop in storage; of moderate importance; Cuyahoga and Licking (February 10) Counties. (Detmers)

Hard rot caused by Septoria gladioli Pass.

New York - produced a death of plants in July and August resulting from the premature decay of parent corm; leafspots on foliage of seedling and cormels; Rensaelaer County, August 1. (Massey)

*Michigan - Clinton, Ingham and Macomb Counties. (Coons)

Prior report: Indiana and Minnesota.

Bacterial leafspot - cause undetermined

Michigan - probably widespread; Ovid, Clinton County. (Coons)

Minnesota - in one field; infection heaviest on variety Maiden Blush, Ramsey County; also Hennepin and Rock Counties. (Sect. Pl. Path.)

GOLDEN GLOW (Rudbeckia laciniata Hort. var.)

Powdery mildew caused by Erysiphe cichoracearum DC.

Connecticut - not bad, New Haven, New Haven County, July 30. (Clinton)

*+New York - probably statewide; Suffolk County, August 19. (Chupp)

Prior reports: *Connecticut, Indiana, *Maryland, *Ohio and West Virginia.

HEDGEHOG (Coneflower) (Echinacea purpurea)

+Mosaic - cause undetermined

New York - Dutchess County, June 17. Collected by Kirby and Honey. (Chupp)

HELLEBORE - See Christmas Rose

HIBISCUS (Hibiscus sp.)

Bacterial blight caused by Bacterium hibisci Nakada & Takimoto

Recent literature:

Nakada, N. and K. Takimoto. Bacterial blight of Hibiscus. Ann. Phytopath. Soc. Japan 1: 13-19. 1923.

+Crown gall caused by Bacterium tumefaciens EFS. & Town.

Mississippi - slight infection; Leflore County, May 1. (Neal & Barker)

+Anthracnose caused by Colletotrichum hibisci Poll.

Florida - collected at two places in the state but resulted in no serious damage. (Weber)

+Wilt caused by Fusarium berkeleyi Mont.

Florida - cause of the loss of a number of plants; appeared to be a soil infection; Howey, Lake County. (Weber)

+Root knot caused by Heterodera radicicola (Greef.) Muell.

Texas - trace, Brazos County. (Taubenhaus)

Leafspot caused by Phyllosticta hibiscina Ell. & Ev. (P. hibisci Pk.)

*+New York - Nassau County, August 10. (Chupp)

Prior report: *Connecticut.

Bacterial wilt - cause undetermined

Florida - found to be the cause of considerable wilting of the host plant. (Weber)

HOLLEY, AMERICAN (Ilex opaca)

Leafspot caused by Phyllosticta ilicicola (Cke. & Ell.) Ell. & Ev.

+New York - common; 10 to 20% of leaves infected. (Chupp)

Prior report: New Jersey.

HOLLYHOCK (Althaea rosea)

+Leafspot caused by Ascochyta althaeina Sacc. & Bizz.

New York - Nassau County, August 10. Collected by W. D. Mills. (Chupp)

Leafspot caused by Cercospora althaeina Sacc.

Delaware - infection later than usually observed; spread very rapidly during September; Kent and Newcastle (Hollyoak) Counties, September. (Adams)

+Mississippi - appeared to be rather serious; Monroe County, June 17. (Neal & Barker)
+Oklahoma - Payne County, November 5. (Stratton)
Prior reports: Alabama, Connecticut, *Delaware, Indiana, *Kansas, Massachusetts, *Michigan, Minnesota, *Nebraska, *Pennsylvania, *Texas, and West Virginia.

Anthracnose caused by Colletotrichum malvarum Br. & Casp.
+New York - Forestville, Chautauqua County, June 30. (Chupp)
Prior report: Ohio.

Root rot caused by Ozonium omnivorum Shear
Texas - hinders the ornamental value; about 10% reduction; Bell County. (Taubenhaus)

Rust caused by Puccinia malvacearum Bertero
Prior reports: Connecticut, *New York, New Jersey, +South Carolina, +Mississippi, Ohio, Colorado, Washington and *California.

HONEYSUCKLE, TATARIAN (Lonicera tatarica)

Powdery mildew caused by Microsphaeria alni (Wallr.) Wint.
+New York - Oswego County, August 30. (Chupp)
Prior reports: Iowa, Minnesota, New York, and *Pennsylvania.

HONEYSUCKLE (Lonicera sp.)

Powdery mildew caused by Microsphaeria alni (Wallr.) Wint.
+New York - Oswego County, August 30. (Chupp)
Prior reports: *Connecticut, *Iowa, *Massachusetts, *Michigan, Minnesota, *Nebraska, New York and Washington.

+Necrosis - cause unknown
Wisconsin - quick drying of top in hot weather, seems to be worse where plant is in semi-shade (5 to 4 hours sunlight); no indication of fungi present, Madison, Dane County, July 15. (Vaughan)

HYACINTH (Hyacinthus orientalis)

+Dry bulb rot caused by Fusarium sp.
Missouri - damage severe; Carterville, Jasper County. (Maneval)

+Nema disease caused by Tylenchus dipsaci (Kuhn) Bast.
Washington - Spokane County. (Heald & Dana)

HYDRANGEA (Hydrangea sp.)

+Root knot caused by Heterodera radicicola (Greef.) Muell.
Mississippi - slight infection Tunica County, April 28. (Neal & Barker)

Powdery mildew caused by Oidium sp.
Florida - has been destructive on the host plant, especially when it was grown under more or less moist, shady conditions. (Weber)

Leafspot caused by Phyllosticta hydrangeae Ell. & Ev.
+Alabama - severe in a nursery in Mobile, Mobile County; the decorative value of the plants was largely destroyed which consequently affected the sale value; locally important; produced large brown blotches on the leaves. (Miles)
Prior report: New Jersey.

INDIGO, FALSE (Amorpha sp.)

+Rust caused by Uropyxis amorphae (Curt.) Schroet.

Florida - collected during May and June on this host plant which was severely attacking the leaflets and defoliating the whole plant; both uredinia and telia stages were present. (Weber)

IRIS (Iris sp.)

Soft rot caused by Bacillus carotovorus L. R. Jones

New York - Tompkins County, May 21. (Chupp)

+Indiana - worst disease with which iris growers had to contend. Tippecanoe and Wells Counties. (Jackson)

Prior reports: Connecticut, Michigan, Minnesota and Ohio.

Recent literature:

Richardson, J. K. Bacterial soft rot of iris. (Abstract) Phytopath. 13: 293. 1923.

________________ A study of soft rot of iris. Ann. Rept. Quebec Soc. Prot. Plants 15: 105-121. 1922-1923.

Leafspot caused by Didymellina iridis (Desm.) von H. (Heterosporium gracile (Wallr.) Sacc.)

Connecticut - New Haven (June 18) and Towland Counties. (Clinton)

New York - important locally; Kirby and Honey reported as follows: Variety Spectabilis 100% infection; varieties, Honorabilis and Madam Cherau slight infection; also reported on Iris versicolor; reported from six counties; Dutchess County, June 17. (Chupp)

+Pennsylvania - Center County. (Thurston).

+Indiana - worse than average year; common about Lafayette, Tippecanoe County, May 25; period of greatest injury about August 1. (Jackson & Gardner)

+Missouri - damage not great; no doubt general over state; common at Columbia, Boone County. (Maneval)

Prior reports: *Connecticut, *District of Columbia, *Kansas, *Maine, *Maryland, *Michigan, Minnesota, *New York and *Texas.

+Wilt caused by Sclerotinia sclerotiorum (Lib.) Mass.

Washington - King County. (Heald & Dana)

Southern blight caused by Sclerotium rolfsii Sacc.

+Mississippi - rather severe local rotting of leaf blades and bulbs; Oktibbeha County, June 25. (Neal & Barker)

+Indiana - noted in numerous gardens about Lafayette, Tippecanoe County; reported from Bluffton, Well County. (Jackson & Gardner). Prior report: *Maryland.

IVY, ENGLISH (Hedera helix)

Leafspot caused by Phyllosticta concentrica Sacc.

+South Carolina - unimportant; Greenville County, May 11. (Ludwig)

Prior report: Alabama, *New Jersey and *Texas.

Leafspot caused by Phyllosticta hederaecola Dur. & Mont.

*+New York - Nassau County, August 6. (Chupp)

Prior report: New Jersey.

IVY, JAPANESE - See Ampelopsis tricuspidata

KALMIA (Kalmia latifolia)

+Leafspot caused by Venturia kalmiae Pk.

New York - Orange County, June 17. (Chupp)

*Leafspot caused by Septoria sp.
Virginia - Mt. Vernon, Fairfax County, June 11. Collected by R. J. Haskell.

LARKSPUR - See Delphinium sp.

LAUREL, CHERRY (Laurocerasus sp.)
+Leafspot caused by Phyllosticta laurocerasi Sacc. & Speg.
Florida - found near Gainesville, Alachua County, and reported from Pensacola, Escambia County, as doing considerable damage to hedges of the host plant causing defoliation. (Weber)

LAUREL, MOUNTAIN - See Kalmia

LILAC, COMMON (Syringa vulgaris)
+Hymenochaete agglutinans Ell.
Connecticut - had girdled to the stem where present; not a serious trouble; new to state on this host; Mansfield, Tolland County, May 6. (Clinton)
Powdery mildew caused by Microsphaera alni (Wallr.) Wint.
Reported from *New York, New Jersey, Delaware, Iowa and California.
+Silver leaf caused by Stereum purpureum Fr.
Oklahoma - Payne County, October 5. (Stratton)

LILY, CANADA (Lilium canadense)
Rust caused by Uromyces holwayi Lagh.
**+New York - Ellis Hollow, May 27. Collected by H. H. Whetzel.
Prior report: *Maine.

LILY, EASTER (Lilium longiflorum)
+Gray mold caused by Botrytis, cinerea type
Florida - serious disease of the flowering parts during the past season; also reported on leaves. (Weber)
+Leafspot caused by Cercospora unicolor S. & P.
Florida - found to be widely scattered and prevalent over the state; very little damage resulted. (Weber)
+Wilt caused by Fusarium sp.
Florida - ruined several large beds of lilies during the past season; not reported elsewhere in the state. (Weber)
+Wilt caused by Sclerotinia sclerotiorum (Lib.) Mass.
Florida - reported as occuring in a flower bed; causing some damage; Jacksonville, Duval County. (Weber)
+Mosaic - cause unknown
Florida - reported widespread over the state; caused loss of plants; Alachua (Gainesville), Hillsborough (Tampa) and St. Lucia (Sebastian) Counties. (Weber)

LOBELIA, LARGE BLUE (Lobelia siphilitica)
Rust caused by Puccinia lobeliae Ger.
**+New York - Tompkins County, October 5. (Chupp)
Prior reports: *Arkansas, *Delaware, *Illinois, *Indiana, *Iowa, *Kansas, *Missouri, *Nebraska and *Wisconsin
Leafspot caused by Septoria lobeliae Pk.
+New York - Oswego (September 10) and Onondaga Counties. (Chupp)
Prior report: *Illinois, *Iowa, *Nebraska and *Wisconsin.

LONICERA - See Honeysuckle

LUPINE (Lupinus sp.)
Botrytis cinerea Pers. and Ascochyta pisi Lib.
Recent literature:
Curtis, K. M. Two fungal diseases of the blue Lupine. New Zealand Jour. of Agr. 14: 240-246. 1923.

MARGUERITE (Chrysanthemum frutescens)
Crown gall caused by Bacterium tumefaciens EFS. & Town.
Recent literature:
Dowson, W. J. Contributions from the Wisley Laboratory. The wilt diseases of Michaelmas daisies. Jour. Roy. Hort. Soc. 48: 38-57. 1923.

MATRIMONY VINE, COMMON (Lycium halimifolium)
+Powdery mildew caused by Cicinnobolus caesatii DBy.
Ohio - of slight importance; Wayne County, September. (Detmers)
+Powdery mildew caused by Erysiphe polygoni DC.
Delaware - usual prevalence observed in New Castle County and associated with leaves showing mite infection. (Adams)
Rust caused by Puccinia lycii Kalch.
Ohio - attacked leaves, Wayne County, October. (Detmers)
Prior reports: *Kansas, Massachusetts, *Nebraska, Ohio and *Virginia.

MIGNONETTE, COMMON (Reseda odorata)
Leafspot caused by Cercospora resedae Fckl.
+Missouri - collected in a greenhouse; Columbia, Boone County. (Maneval). Prior reports: Connecticut, *District of Columbia, *Illinois, Indiana, *Massachusetts, *Mississippi, Missouri and *Pennsylvania.

MORNING GLORY (Ipomoea purpurea)
White rust caused by Albugo ipomoeae-panduranae (Schw.) Sw.
Mississippi - general and heavy; Oktibbeha County, August 30. (Neal & Barker)
Prior reports: *Alabama, *Delaware, *Georgia, Kansas, *Mississippi, *Virginia and West Virginia.
Rust caused by Coleosporium ipomoeae (Schw.) Burr.
+Mississippi - general and heavy; Oktibbeha County, September 15. (Neal & Barker)
Prior reports: *Alabama, *Arkansas, *Illinois, *Louisiana, *Mississippi, *Missouri, and *Texas.
+Rust caused by Puccinia ipomoeae-panduratae (Schw.) Syd. (P. ipomea Cke.)
+Oklahoma - Payne County, October 15. (Stratton)
+Stem canker caused by Vermicularia ipomearum Schw.
New York - Kirby and Honey report new disease for the state; not in the herbarium nor given in North American Flora. (Chupp)

MOUNTAIN LAUREL - See Kalmia

NASTURTIUM, COMMON (Tropaeolum majus)
Leafspot caused by Bacterium aptatum Brown & Jamieson
+Mississippi - Lincoln County, May 28. (Neal & Barker)
Prior report: New Jersey.

Wilt caused by Bacterium solanacearum EFS.

+Florida - very severe on nasturtiums during the past season, killing practically all plantings in the vicinity of Gainesville; the first symptoms became evident when the plants began to blossom; 100% of the plants were affected and most of them died. (Weber)

Prior reports: Maryland and Virginia.

+Leafspot caused by Pleospora herbarum (Pers.) Rabh.

Ohio - one report; causes spotting and death of leaves; McConnellsville, Morgan County, June 27. (Young)

OLEANDER (Nerium oleander)

Leafspot caused by Phyllosticta sp.

Florida - large brown spots on the leaves caused some defoliation. (Weber)

Specked leafspot caused by Septoria sp.

Florida - caused some defoliation but not of a serious nature. (Weber)

ORCHID

Leafspot caused by Diplodia sp.

Florida - caused considerable loss of foliage; Palm Beach, Palm Beach County. (Weber)

OXALIS (Oxalis sp.)

Rust caused by Uredo oxalidis Lev.

+Florida - caused 100% infection, killing all the foliage in two to three weeks; Alachua (Gainesville and Micanopy, February), Manatee (Oneco, May) Counties. (Weber).

Prior report: Texas.

PALM

Anthracnose caused by Colletotrichum sp.

South Carolina - Beaufort County. (Ludwig)

Leafspot caused by Gloeosporium sp.

New York - Albany, Albany County, September 2. (Chupp)

False smut caused by Graphiola phoenicis (Moug.) Poit.

Louisiana - Reserve, St. John County, September. (Edgerton)

PALM, COCOANUT (Cocos nucifera)

Wilt - cause unknown

Florida - leaves become yellow and wilt one after another until the bud falls from the top of the plant.. A Pythium sp. has been obtained most consistently in isolation cultures. (Weber, J. F. Field work in Florida during the year on disease control. Quar. Bul. Fla. State Pl. Bd. 8: 3-4. Oct. 1923.

PALM, CANARY DATE (Phoenix canariensis)

Leafspot caused by Exosporium palmivorum Sacc.

*Louisiana - East Baton Rouge County. (Edgerton)

False smut caused by Graphiola phoenicis (Moug.) Poit.

**+Florida - New Augustine, St. Johns County, November. (Kniskern)

Prior reports: *California, *District of Columbia, Louisiana, *Mississippi, *New York and *Pennsylvania.

PALM, DATE (Phoenix sp.)

Leafspot caused by Exosporium palmivorum Sacc.

+Florida - caused very serious losses to these plants; reported from the whole state in general; especially severe in nurseries and along the East Coast; in many instances total defoliation and destruction of the plant was reported; it was widespread but not destructive as a whole. (Weber)

Prior report: *Mississippi.

+Leafspot caused by Ramularia sp.

Florida - not of economic importance; Gainesville, Alachua County, September. (Weber)

PALM, MEXICAN WASHINGTON (Washingtonia robusta)

Wilt - cause unknown

Florida - the wilt associated with Pythium mentioned on the preceding page under cocoanut palm has been noted on this host. (See palm, cocoanut)

PALM, WASHINGTON (Washingtonia sp.)

+Leafspot caused by Pestalozzia palmicola S. & B.

Florida - destructive to the leaves, Gainesville, beginning at the tips of the leaves and gradually working toward the petiole, killing the tissue and turning it brown; serious on plants used for ornamental purposes. (Weber)

PALMETTO (Sabal sp.)

False smut caused by Graphiola phoenicis (Moug.) Poit.

+Florida - common. (Weber)

Leafspot caused by Pestalozzia palmicola S. & S.

+Florida - common; often causing partial defoliation. (Weber)

Bacterial leafspot - cause undetermined

Florida - caused death of leaves on several plants; not common; collected at Tampa. (Weber)

PANSY (Viola tricolor)

Leafspot caused by Alternaria violae Gall. & Dorsett

+New York - Monroe County, September 9. Collected by E. F. Guba. (Chupp). Prior report: *Pennsylvania.

Leafspot caused by Colletotrichum violae-tricoloris Sm.

+New York - Monroe County. Collected by E. F. Guba. (Chupp)

Prior reports: Massachusetts and New Jersey.

+Root rot caused by Pythium debaryanum Hesse

Connecticut - New Haven, New Haven County, July 11. (McCormick)

+Leafspot caused by Ramularia sp.

Washington - Grays Harbor County. (Heald & Dana)

+Black root rot caused by Thielavia basicola (Berk. & Br.) Zopf.

Connecticut - Westville, New Haven County, June 28. (McCormick)

PEONY (Paeonia spp.)

Leafspot caused by Alternaria sp.

*+Kansas - under observation; out of forty-four varieties examined eight showed marked resistance and were practically free from the disease; mature plants only seem to be susceptible; the spot does not show up until after blossoming and apparently causes little damage to the vitality of the root stock;

Topeka, Shawnee County. Collected by R. P. White. (White)

Prior report: Nebraska.

Blight caused by Botrytis paeoniae Oud.

+Alabama - locally important; in a greenhouse at Mobile and a lawn planting in Tuscaloosa County; plants badly affected; some killed. (Miles)

Ohio - one report; Champaign County, September 7. (Detmers)

+New York - very injurious; statewide; Whetzel reports one very early variety always severely affected; also collected by Whetzel on Paeonia grandiflora and P. officinalis rubra, Tompkins County, May 6. (Chupp)

Tompkins County -- 10% of new shoots of 100 plants killed.
Monroe County -- 50% of 50 plants, 5% of new shoots killed.
Nassau County -- 10% of shoots infected.
Genesee County -- common on blossom buds, 2 to 5% injured.

On May 6, the shoot rot stage just began; all infection starts below the surface of the soil. (Whetzel)

Prior reports: Delaware, Idaho, *Maryland, *Massachusetts, Michigan, Minnesota, New Hampshire, *New York, Ohio, *Pennsylvania, *Rhode Island, Utah and *Virginia

Gray mold rot caused by Botrytis sp.

+Connecticut - two reports; possibly follows Pythium injury; Hamden, New Haven County, May 21. (Clinton)

Pennsylvania - Center and Perry Counties. (Thurston)

Leaf mold caused by Cladosporium paeoniae Pass.

+Alabama - unimportant; found in a nursery in Mobile County. (Miles)

*+Kansas - general in range; great range in susceptibility; over 50 varieties examined in several nurseries, Felix Gussee Variety most susceptible of all; destroyed leaf area reaches from 0 to 90%; attacks host immediately after blooming; first report but has been present for years; Topeka, Shawnee County, June 13. (White)

Prior reports: Alabama, *Alaska, Connecticut, *District of Columbia, Indiana, *Iowa, *Maryland, Michigan, Minnesota, *Mississippi, *Missouri, New Jersey, *Ohio and Washington.

Dry bulb rot caused by Fusarium sp.

+Missouri - Carterville, Jasper County. (Maneval)

Prior reports: *Indiana and *Nebraska.

Root knot caused by Heterodera radicicola (Greef.) Muell.

+New York - Mt. Vernon, Westchester County, October 21. (Strayer)

+Mississippi - very serious in a nursery, April 26. (Neal & Barker)

Prior reports: Nebraska, Ohio and Pennsylvania.

Stem rot caused by Phytophthora sp.

+Connecticut - attacked the stems both above and below the ground; apparently infected as they came through the ground; both Botrytis and Phytophthora present but the latter is apparently the first invader and cause; Hamden, New Haven County. (Clinton). Prior reports: Kansas and Pennsylvania.

+Wilt caused by Verticillium albo-atrum Reinke & Berth.

Kansas - found only in one nursery, about 1% of the plants affected; no varietal resistance noted, July 10. (White)

Leafspot - yellows - mosaic - cause undetermined

+Kansas - slight importance; some entire plants show this and other plants only one and two stalks; Leavenworth, (Leavenworth, July 10) Shawnee and Wyandotte Counties. (White)

Prior reports: *Massachusetts and *Virginia.

Recent literature:

Auten, Edward, Jr. X-ray treatment for peony root gall. Flower Grow. 10: 308. Sept. 1923.

________________ Spraying peonies pays. Flow. Grow. 11: 23. Jan. 1924.

Coulson, J. G. Peony diseases. (Abstract) Phytopath. 13: 292-293. 1923.

________________ Peony diseases. Ann. Rep. Quebec Soc. Prot. Plants. 15: 67-70. 1922-23.

PETUNIA (Petunia sp.)

Mosaic - cause unknown

+Connecticut - rather bad in potted plants in a greenhouse, July 6. (Clinton)

+Louisiana - of little importance; noticed at Baton Rouge, East Baton Rouge County, January; first record of disease in state. (Edgerton). Prior reports: Iowa and Pennsylvania.

PHLOX (Phlox sp.)

+Crown gall caused by Bacterium tumefaciens EFS. & Town.

New Jersey - Richfield, September 29. (Dept. Pl. Path.)

Anthracnose caused by Colletotrichum sp.

+Florida - local and not serious; caused canker-like lesions on the stems. (Weber). Prior report: *District of Columbia.

Powdery mildew caused by Erysiphe cichoracearum DC.

Reported from New Hampshire, Connecticut, New York and *Ohio. Prior reports: Alabama, *Florida, *Indiana, *Louisiana, *Maine, *Maryland, *Massachusetts, Michigan, *Minnesota, *New Jersey, *New York, *Vermont, *Virginia, *Washington, West Virginia and *Wisconsin.

Leafspot caused by Septoria sp.

New York - reported on Phlox maculata and P. drummondi; Tompkins County, June 10; this is an undescribed species of Septoria. (Chupp)

Powdery mildew caused by Sphaerotheca humuli (DC.) Burr.

+Kansas - Decatur County. (White). Prior report: Ohio.

PHYSOSTEGIA (Physostegia sp.)

Root rot caused by Fusarium sp.

+Kansas - Kansas City, Wyandotte County, September 12. (White)

PITTOSPORUM (Pittosporum sp.)

+Stem rot caused by Sclerotium rolfsii Sacc.

Florida - not common or widely spread; caused considerable damage to the host plant; Jacksonville, Duvall County. (Weber)

POINCIANA, ROYAL (Poinciana regia)

+Anthracnose caused by Gloeosporium sp.

Florida - reported from Bradentown, as causing slight damage; not common, Manatee County. (Weber)

POINSETTIA (Poinsettia pulcherrima)

+Twig blight caused by Bacterium sp.

Florida - caused considerable apprehension during the past season by causing twigs and new vigorous growth to die; not serious. (Weber)

+Wilt caused by Fusarium sp.

Florida - quite common in the vicinity of Gainesville, Alachua County; usually killed the plant; the leaves turned yellow and fell; the newest leaves were shed last and the plants usually dried. (Weber)

POPPY (Papaver sp.)

+Leafspot caused by Cercosporella sp.

Florida - killed the leaves at blossoming time; Gainesville, Alachua County. (Weber)

PRIVET (Ligustrum sp.)

+Root rot caused by Armillaria mellea (Vahl) Quel.

Mississippi - appears to be general and frequently causes considerable damage to hedges; Washington County, August 14. (Neal & Barker)

+Crown gall caused by Bacterium tumefaciens EFS. & Town.

Mississippi - apparently widespread, although had not been previously listed as susceptible; Ligustrum hicidum seemed particularly susceptible; also found on California, Nepals and Amoor River privets. (Barker & Neal)

+Root knot caused by Heterodera radicicola (Greef.) Muell.

Mississippi - California variety affected; other varieties in same nursery not affected, May 11. (Neal & Barker)

Root rot caused by Ozonium omnivorum Shear

Texas - prevalent; caused 1% reduction in yield. (Taubenhaus)

QUINCE, FLOWERING or JAPANESE - See Cydonia japonica

RASPBERRY, FLOWERING - See Rubus odoratus

RHODODENDRON, COAST (Rhododendron californicum)

+Leafspot caused by Coryneum rhododendri Schw.

Oregon - not abundant; Rujada, Lane County, June 17. (Boyce)

Rust caused by Melampsoropsis piperiana Arth.

Oregon - rare; Waldport, Lincoln County, October 10. (Boyce)

+Bud blight caused by Sporocybe azaleae (Pk.) Sacc.

Oregon - rare; Rujada, Lane County, June 17. (Boyce)

RHODODENDRON (Rhododendron sp.)

+Leafspot caused by Discosia sp.

New York - on Rhododendron maximum; Dutchess County, August 31. (Chupp)

+Leafspot caused by Monochaetia sp.

New York - Nassau County, June 1. (Chupp)

+Leafspot caused by Mycosphaerella rhododendron Cke.

New York - on Rhododendron purpureum and R. maximum; Nassau County, June 1. (Chupp)

Leafspot caused by Pestalozzia guepini Desm.

+New York - Kirby and Honey found it at Rochester on the following species: Rhodendron arborescans, R. carolinianum, and R. catawbiense; also found in Putnam County, June 16. (Chupp)

+New Jersey - controlled by spraying with Bordeaux mixture and removing leaves; Bridgeton, Cumberland County. (Dept. Pl. Path.)

Prior reports: Connecticut, Delaware and *Indiana.

+Leafspot caused by Phyllosticta saccardoi Thuem.

New York - found on Rhododendron maximum and R. carolianum. (Chupp)

ROSE, CHRISTMAS - See Hellebore

ROSEMALLOW - See Hibiscus

ROSE (Rosa gentiliana)

*+Olpitrichum macrosporum (Farlow) Sumstine, probably saprophytic of the genus Olpitrichum

Maryland - Bell Station, June 28; collected by Anna E. Jenkins; of interest as it has added new information to the knowledge. (Jenkins)

ROSE (Rose hugonis)

+Sphaeronemella rosae Ell. & Ev.

*Maryland - experiment rose garden; on leaves and hips; Bell Station, October 25. Collected by Anna E. Jenkins. (Jenkins)

*Virginia - Rossyln National Rose Test Garden, Arlington Experiment Station; collected by Anna E. Jenkins; on leaves and hips; the fungus is isolated and grows in pure culture. Specimens from which the fungus is described were collected at Newfield, New Jersey, June 1889 and issued as number 2566 Ell. & Ev. North American Flora; this is the only other specimen of this fungus in the Pathological Collections. (Jenkins)

ROSE (Rosa spp.)

Crown gall caused by Bacterium tumefaciens EFS. & Town.

Connecticut - Cromwell, Middlesex County, August 29. (Clinton)

New Jersey - heavy infection noted in a greenhouse; causes galls 1 to 1-1/2 inches in diameter on crown and roots. (Dept. Pl. Path.)

+Mississippi - general; rather serious in many nurseries, April 27. (Neal & Barker)

+Louisiana - local; Baton Rouge, East Baton Rouge, January. (Edgerton)

+North Dakota - found on Rosa rubiginosa; important locally; has been shipped into state with nursery stock; Bismarck, Burleigh County, April. (Weniger)

Prior reports: *District of Columbia, Illinois, Indiana, Maryland, *Massachusetts, Michigan, Minnesota, New Hampshire, New Mexico, New York, Ohio, *Pennsylvania and Washington.

Botryosphaeria ribis Gross & Dug.

*Maryland - Bell Station, March, June and October. Collected by Anna E. Jenkins. (Jenkins). Prior report: Virginia.

Bud blast and canker caused by Botrytis cirerea Pers.

New York - following winter injury canker on cultivated seedlings and bud blast on wild rose, Seneca County, May 14. (Chupp)

+South Carolina - important locally; complicated with thrips injury and probably following it; the combination effectively prevented the production of good flowers in some places, Horry

(Nichols, May 16), Pickens and Richland Counties; period of greatest injury May 15 to 30; weather relations during the season moist. (Ludwig)

Botrytis sp.

*Maryland - on Rosa sp. variety "Radiance" and also on other varieties; at the Darrow Tract, Bell Station; collected by Anna E. Jenkins, April 21. The fungus was isolated from discolored diseased areas on stems of plants kept over winter in outdoor heeling bed. (Jenkins)

+Mississippi - usually formed cankers at the base of twig, Sunflower County, April 6. (Neal & Barker)

Texas - produced a rot; local. (Taubenhaus)

Prior reports: Delaware, Indiana, Maryland, Massachusetts, Michigan, Montana, New York, Ohio, Texas and Washington.

Leafspot caused by Cercospora rosicola Pass.

+South Carolina - Calhoun, Pickens County, September 11. (Ludwig)

+Florida - almost universally present where roses were grown; it ranked next to powdery mildew in importance. (Weber)

Mississippi - McLean, Green County, August 15. (Barker)

Prior reports: *Alabama, Connecticut, *District of Columbia, *Florida, *Georgia, Indiana, *Iowa, *Louisiana, Michigan, Minnesota, *Mississippi, *Missouri, *Nebraska, New Jersey, *New York, *South Carolina, *Texas, Washington, West Virginia and Wisconsin.

Coniothyrium sp.

*New York - Cold Spring, Putnam County, June 2. (Jenkins)

*+Maryland - Experimental Rose Garden, Bell Station, June 28. Collected by Anna E. Jenkins. (Jenkins)

*Virginia - National Rose Test Garden, Arlington Experiment Farm, Rosslyn, Arlington County, April 2. Collected by Anna E. Jenkins. (Jenkins)

*Georgia - Augusta, Richmond County, June 20. (Jenkins)

Crown canker caused by Cylindrocladium scoparium Morgan

New York - first report of the disease outside of the greenhouse; reported as severe each year and producing a $2,000 yearly loss; cuttings placed in cold frame in fall and covered with glass and straw during the winter; Monroe County, May 15. (Massey)

Pennsylvania - in a greenhouse at Southampton, Bucks County, August 4. This fungus was identified in 1914 from a culture received from A. H. Graves, Yale University, which was isolated from the seed bed of the Yale Forest School Nursery. (Jenkins). Prior reports: Georgia, Indiana, Massachusetts and New York.

*Indiana - severe loss in one greenhouse; affected mostly the Butterfly variety, Princeton, Gibson County, August 28. (Gardner)

+Blight caused by Dicoccum rosae Bon.

Florida - found but once in the state; causing slight injury. (Weber)

Leaf blotch caused by Diplocarpon rosae Wolf, (Actinomena rosae (Lib.) Fr.

Connecticut - local; Hartford County, July 14. (Clinton)

New York - statewide range; found on wild uncultivated rose; found by Kirby and Honey on the inspection of 80 species of roses in a park at Rochester, September 21, at which the following data were collected: 12 species - no infection; 43 species - light infection.

Pennsylvania - (Thurston)

New Jersey - found in greenhouse; only slight infection. (Dept. Pl. Path.)

Delaware - more common than usual and causing severe defoliation. (Adams)

Kentucky - the following varieties have been free from black spot during the summer and fall in my garden: Madam Butterfly, Climbing American Beauty, Dr. Van Fleet and Christine Wright. The following varieties have been nearly defoliated: Los Angeles, Tausendschon, J. B. Clark, Wm. R. Smith and Gruss An Teplitz. (Valleau)

South Carolina - locally important. (Ludwig)

Alabama - important; general. (Miles)

Mississippi - probably the most common disease of roses in the state; it does much damage to the appearance of the leaves and thus seriously affects the beauty of the cut flowers and rose bushes; some varieties were apparently more susceptible to the disease than others; satisfactory control of the disease was obtained by spraying with Bordeaux mixture or ammoniacal copper-carbonate. (Neal & Barker)

Texas - (Taubenhaus)

Oklahoma - rather prevalent. (Stratton)

Ohio - slight; caused spotting of leaves, Morrow County, July 27. (Detmers)

Indiana - serious in greenhouses. (Gardner)

Kansas - (White)

Washington - (Heald & Dana)

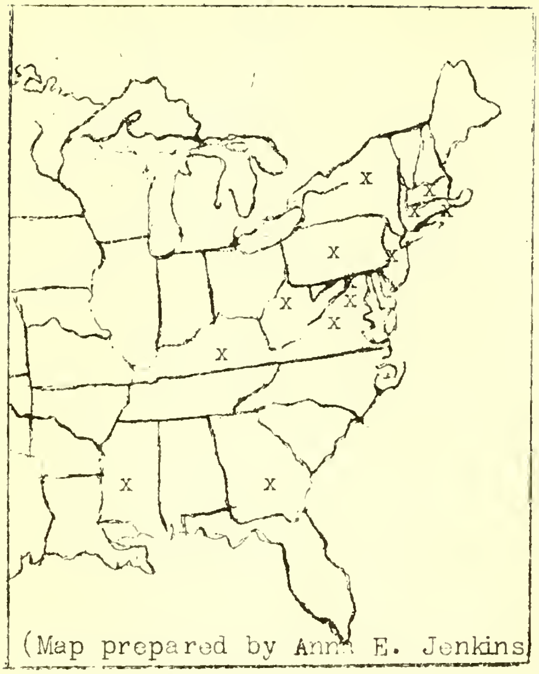
Recent literature:

Loge, U. S. A new method of controlling blackspot. Flor. Exch. 57: 437, 469. Feb. 16, 1924. Method of control as follows: Sodium carbonate 1-1/2 ounces crystalline salt to one gallon water; or 3/4 ounces anhydrons to one gallon water with whole oil soap.

Brown canker caused by Diaporthe umbrina Jenkins

Report prepared by Anna E. Jenkins, Office of Plant Disease Survey and Pathological Collections.

Brown canker was first observed in the form of stem cankers in the National Rose Test Garden at Arlington Experiment Farm, Virginia, in April 1917 (Journal of Agricultural Research 15: 593-600. 1918). The disease has been under observation since that time and has been found to occur on most of the other parts of the plant above the ground. The presence of the disease in the Test Garden is also mentioned in an article by Clarence T. Lintz in the Florist's Exchange 55: 16-38, June 9, 1923. In June 1923 specimens of brown canker were collected in the experimental perfume rose gardens of the office of Drug, Poisonous and Oil Plant Investigations. It was also observed on cuttings in a propagation bed in one of the greenhouses. Where this has been under observation it has proved one of the most important rose diseases, the horticultural varieties being particularly susceptible. It seems likely that brown canker may be the cause of serious loss in nurseries as well as in rose gardens and that plants affected with it are often not recognized as diseased and consequently have been widely distributed.



(Map prepared by Anna E. Jenkins)

Fig. 16. Present known distribution of brown canker of roses.

Suggestions for the control of the disease were given in the paper on brown canker referred to in the preceding page. From further observations on the nature of the disease the importance of excluding the pathogene from healthy gardens is emphasized. Experiments designed to show whether initial infection on canes of the current year may be prevented by keeping this growth covered with a fungicide are in progress at the National Rose Test Garden. The results of the season's experiments are promising. The results of the season's spraying experiments showed that certain very susceptible varieties remained healthy while unsprayed plants of the same varieties were as usual heavily infected.

No systematic survey to determine the geographical distribution of brown canker has been made, but from a study of the specimens mentioned below it is definitely known to have occurred in certain states east of the Mississippi River and indicated in Fig. 16.

Diagnoses of the disease have been made from specimens of affected stems, leaves and blossoms received from the following states: (Unless otherwise stated the fungus was present on the stem).

Connecticut, New Canaan, 1917.

District of Columbia, one collection was made May 30, 1903. On June 19, 1922 a garden was visited in which all of the hybrid roses were very severely affected and some of the plants had died. On June 28, 1923 the disease was collected from potted plants of the variety Lady Ashton on sale at a florist shop; these bushes were said to have been obtained from a nursery in Pennsylvania about two months previous and were being sold for outdoor planting.

Georgia, Columbus, April 1917. Atlanta June 19, 1923 (on unopened buds).

Kentucky, Ashland July 2, 1920.

Maryland, Bowie, April 25, 1923; the plants appeared healthy in the previous fall, but many of them were dying back to the ground in the spring. Bell Station, June 8, 1920 and March 21 and October 25, 1923. (Collected on several different varieties.)

Massachusetts, Amherst, May 1921. The canker was very common on hybrid roses about Amherst. It was very destructive and in one garden had necessitated a severe cutting back of the canes.

Mississippi, Mendenhall, June 14, 1919.

New Jersey, New Brunswick, October 5, 1917. Formed a spot on leaflets of the Prairie Rose (*Rosa setigera*).

New York, Cold Spring on the Hudson, June 24, 1923.

Pennsylvania, Greencastle, April 25, 1922, Westchester, May 29, 1922.

Rhode Island, Rockland, June 28, 1922. On the blossoms. *Botrytis cinerea* also present. It may be stated that bud blight of roses is commonly attributed to *Botrytis cinerea*, but it has been observed that the infection by the Diaportha fungus may precede the development of the more conspicuous Botrytis. In the case of the specimen from Rhode Island the trouble had been diagnosed as blossom blight caused by *Botrytis cinerea*, but a careful examination showed pycnidia of *Diaporthe umbrina* were also fruiting on the petals.

Virginia, Chatham, May 15, 1915; Ivy Depot, June 17 and March 19, 1921 (in one garden a very fine collection of roses had been severely attacked by the blight, the disease was reported as occurring on stem of old wood). Upton, June 1, 1919; Stevensburg, June 3, 1923 (on unopened blossoms); Rosslyn, Arlington Experimental Farm 1917 to 1923.

Twig blight caused by *Gloeosporium rosae* Hals.

+Florida - apparently well scattered but not of a serious consequence. (Weber)

Prior reports: *District of Columbia, *Indiana, *Louisiana, Maryland, Mississippi, New Jersey, Ohio, Oklahoma, *Pennsylvania, South Carolina, Virginia and West Virginia.

Anthracnose caused by *Gloeosporium* sp.

*Virginia - on *Rosa* sp. variety Marguerita Dickson; National Rose Test Garden, Arlington Experiment Farm, Rosslyn, Arlington County, March 22; perfect stage developed in the cultures made. (Jenkins)

Root knot caused by *Heterodera* sp.

+New Jersey - infested plants show no apparent reduced vigor; small knots are formed on rootlets; in a greenhouse. (Dept. Pl. Path.)

Canker blight caused by *Leptosphaeria coniothyrium* (Fckl.) Sacc. (*Coniothyrium fuckelii* Sacc.)

New Jersey - cankers form graft causing the death of scion; reported a 15% infection in a greenhouse. (Dept. Pl. Path.)

Mississippi - serious in many plantings; general over state; Oktibbeha County, April 7. (Neal & Barker)

Texas - (Taubenhaus)

Prior reports: California, Colorado, *District of Columbia, Indiana, Iowa, Kansas, *Maryland, *Massachusetts, Michigan, Minnesota, *New Jersey, North Carolina, Ohio, *Pennsylvania, South Carolina, *Texas, *Virginia and West Virginia.

Root rot caused by *Ozonium omnivorum* Shear

Texas - prevalent; 3% loss. (Taubenhaus)

+*Leaf blotch* caused by *Pestalozzia compacta* Sacc.

Florida - caused considerable defoliation; well scattered but not severe. (Weber)

Rust caused by Phragmidium spp.

New York - probably statewide; found on wild and cultivated roses; among 80 species in a Rochester Park found only on Rosa alba by Kirby and Honey; very severe in Tioga County; Ulster County, June 3. (Chupp)

+South Carolina - unimportant, Marion County, July 31.

North Dakota - on wild roses; common. (Weniger)

Minnesota - Cottonwood, St. Louis and Wabasha Counties. (Dept. Pl. Path.)

Colorado - first time this has been collected on cultivated roses at Ft. Collins, Larimer County, July. (Learn)

California - Santa Ana, Orange County, September 5; common. (Harter & Weimer)

Leafspot caused by Phyllosticta rosae Desm.

Delaware - usual prevalence observed and associated with defoliation in many instances. (Adams)

Leafspot caused by Phyllosticta rosicola Massal.

New Jersey - New Brunswick, Middlesex County, September 5. (Dept. Pl. Path.)

Ramularia macrospora Fres.

*District of Columbia - Department of Agriculture Greenhouse, Propagation Grounds; diseased conditions observed in the autumn of 1923; symptoms remarkably like those of brown canker; Ramularia macrospora Fres. fruiting on roots and crown of plants examined; fungus isolated and grown in pure culture; comparative cultural studies with crown canker organism have been made. (Jenkins)

+Canker caused by Septoria rosae Desm.

Mississippi - produces a canker on the stem in association with Coniothyrium; Oktibbeha County, April 7. (Neal & Barker)

+Leafspot caused by Septoria rosicola Desm.

South Carolina - unimportant; Edgefield, Edgefield County, June 12. (Ludwig)

Powdery mildew caused by Sphaerotheca spp.

Reported from Connecticut, New York, Pennsylvania, New Jersey, Delaware, Kentucky, South Carolina, Florida, Mississippi, Alabama, Louisiana, Texas, Oklahoma, Ohio, Indiana, Minnesota, Kansas, Colorado, Arizona, Washington and California.

At Rochester, New York, Kirby and Honey made an inspection of 80 species of roses at a park September 25, at which the following data was collected:

Degree of infection	No. of species
None	46
Light	26
Moderate	2
Heavy	0
Very heavy	0

In Kentucky out of 9 varieties examined by Valleau in his garden during the summer and fall the Los Angeles variety was the only one injured by the mildew.

Winter injury

Washington - (Heald & Dana)

Chlorosis caused by too much lime

Texas - prevalent. (Taubenhaus)

Mosaic - cause unknown

Connecticut - Marchioness of Dufferin variety affected; not on the other varieties; do not know if infectious; new host to state; Hartford, Hartford County, July 14. (Clinton)

Miscellaneous causeal organisms

Virginia - Rosslyn; in greenhouse at Arlington Experimental Farm, Arlington County, Spring; collected by Anna E. Jenkins. The following fungi were present on diseased cuttings in propagation bed: *Coniothyrium* sp., *Dothiorella* sp., *Gloeosporium* sp., *Botrytis* sp., *Phomopsis* sp. and *Diaporthe umbrina* J. (on greater part of affected cuttings). (Jenkins)

Recent literature:

Barker, H. and D. C. Neal. Cankers (*Septoria rosae*, *Coniothyrium fuckelii*, *Botrytis* sp. and apparently several other fungi). Quart. Bul. Miss. State Pl. Bd. 3: 13-34. Jan. 1924.

Darlington, H. R. A preliminary note on a new rose disease. Rose Annual Nat. Rose Soc. 181-184. 1923. "The fungus, which is apparently the cause of the disease, permeates the soil principally as thin cotton-like strands, and where there is manure occurs as a greyish-white powdery film. So far the identity of the fungus has not been ascertained, nor whether it is really the cause of the disease."

Edgerton, C. W. Rose diseases in Louisiana. Louisiana Agr. Exp. Sta. Extension Div. Cir. 62: 1-8. 1923.

Ramsbottom, John. The earliest description of a rose disease. Rose Annual Nat. Rose Soc. 163-170. 1923.

Shelley, A. D. G. Winter spraying. Rose Annual Rose. Soc. 62-64. 1923.

Horne, Essig and Herms. Cold Injury. California Agr. Exp. Sta. Cir. 265: 1-104. June 1923. "Many plants are found in spring with dark-stained leaves of small distorted and sickly foliage, due to chilling of tender tissue of shoots, which start growth too early in winter. Delay pruning until February or later. Prune rather heavily and stimulate vigorous growth by general culture measures."

RUBUS ODORATUS

Powdery mildew caused by *Sphaerotheca humuli* (DC.) Burr.

New York - Tompkins County, July 22. (Chupp)

Fly speck cause undetermined

New York - Cattaraugus County, June 25. (Chupp)

Mosaic - cause undetermined

New York - Tompkins County, June 1. (Chupp)

SMILAX (Smilax sp.)

Rust caused by *Puccinia smilacis* Schw.

*+Florida - common but not serious. (Weber)

Prior reports: *Alabama, *Arkansas, *Delaware, *District of Columbia, *Georgia, *Kansas, *Kentucky, *Louisiana, *Maryland, *Mississippi, *Nebraska, *New Jersey, *North Carolina, *Ohio, *Oklahoma, *South Carolina, *Tennessee, *Texas, *Virginia and *West Virginia.

SNAPDRAGON (Antirrhinum spp.)

Anthracnose caused by Colletotrichum antirrhini Stew.

New Jersey - severe under glass at Mt. Holly; attacks seedlings causing early death; 125,000 plants affected; Mt. Holly, Burlington County, November 22. (Dept. Pl. Path.)

+Mississippi - severe; Jones County, June 22. (Neal & Barker)

Prior reports: Connecticut, Delaware, Indiana, *Maine, *Massachusetts, Michigan, *New York, Ohio, Pennsylvania, and *Rhode Island.

Leafspot caused by Phyllosticta antirrhini Syd.

*+New York - severe locally, Westchester (May 12), Tompkins (May 15), Counties. (Chupp)

Prior reports: Indiana, Massachusetts and *Virginia.

Rust caused by Puccinia antirrhini Diet. & Holw. (Dicaeoma antirrhinii)

Connecticut - Bristol, Hartford County, July 20. (Clinton & Hunt)

New York - occasionally very serious; 100% infection at times; reported from four counties; in three flower beds at Ithaca, the percentage of infection was 5, 15 and 75% respectively; Westchester County, May 12. (Chupp)

Pennsylvania - Beaver County. (Thurston)

Delaware - much less prevalent than usual; sulphur dust has given effective control; Newark, July 6. (Adams)

+Kentucky -"both in 1922 and this year appeared about September 1 in my garden; later some of the plants were nearly completely defoliated; in both cases the plants were raised from seed and all 1922 plants were destroyed in the fall." (Valleau)

Ohio - of slight importance; local; most serious as a greenhouse disease; in open the disease appears in late summer, shortening the blooming season; Wooster, Wayne County, August 15. (Young)

Indiana - very serious both in field and greenhouse; more serious outdoors because it cannot be controlled; in greenhouse careful watering prevents spread. (Mains); Loganport, Cass County, June 22. (Gardner)

+Wisconsin - minor importance; Madison, Dane County, July 10. (Vaughan)

Kansas - present quite generally over the state and causing death of snapdragons in the gardens. (White)

Washington - Asotin, Thurston and Pierce Counties. (Heald & Dana)

Recent literature:

Butler, O. Experiments on the field control of snapdragon rust together with a description of a method for the control of the disease in greenhouses. New Hampshire Agr. Exp. Sta. Tech. Bul. 22: 1-14. 1923.

Horne, Essig & Herms. Puccinia antirrhini in California. California Agr. Exp. Sta. Cir. 265: 1-104. June 1923.

McCallan, E. A. Snapdragon rust. Agr. Bul. Bermuda Dept. Agr. 2: 7. 1923.

SNOWDROP (Galanthus nivalis)

Smut caused by Urocystis galanthi Pape

Recent literature:

Pape, H. Ein neuer, auf Schneeglöckchen (Galanthus nivalis L.) schmarotzender Brandpilz (Urocystis galanthi Pape).

A new smut (Urocystis galanthi) parasitic on the snowdrop (Galanthus nivalis L.) Arb. Biol. Reichsanst. fur Land - und Forstwirtsch. 11: 331-336. 1923.

SWEET PEA (Lathyrus odoratus)

Streak caused by Bacillus lathyri Manns & Taub.

+Pennsylvania - Delaware County. (Thurston)

Prior report: Delaware.

Anthracnose caused by Colletotrichum pisi Pat.

+South Carolina - the disease became very destructive during April in a few small beds at Quincy, Gadsden County; early in April it began at one end of the bed and worked across, the younger portions of the stems being most severely attacked; that part above the lesions dying quickly. (Tisdale)

Prior report: *Georgia.

Powdery mildew caused by Erysiphe polygoni DC.

+New York - collected at Riverhead, Long Island County, June 1 by Messer, Guba and Rhinebeck. (Chupp)

+North Dakota - unimportant. (Weniger)

Root rot caused by Fusarium sp. et al

New York - serious; probably statewide; 3 to 5% loss Tompkins County, October 3. (Chupp)

+Wilt caused by Fusarium lathyri Taub.

North Dakota - fairly common; general; 10% loss. (Weniger)

+Wilt and stem rot caused by Fusarium vasinfectum Atk.

Florida - reported as the cause of the loss of 5% of the sweet peas in several gardens. (Weber)

Anthracnose caused by Glomerella cingulata (Stonem.) S. & v. S. (G. rufomaculans Berk.) Sp. & v. Schr.)

*+South Carolina - a severe epidemic in the northwest corner of the state in late May and early June during a period of warm moist weather at blooming time. (Ludwig)

+Florida - caused considerable leafspotting; Hillsborough, Gasden County. (Weber)

+Alabama - important locally in Lee County where an entire planting was absolutely destroyed, the young growth being blighted before buds could open. (Miles)

+Mississippi - very serious during year; leaves, stems and flowers affected; general over state; frequently a typical "blight"; Lawrence County, May 15. (Neal & Barker)

Powdery mildew caused by Microsphaera alni (Wallr.) Wint.

New York - The following table indicates the degree of infection found in various counties:

County	Degree of Infection
Bronx	Trace in greenhouse; severe locally, May12.
Dutchess Suffolk	Infection general on foliage; common in greenhouses.
Cortland	Counts show 100% plants infected and nearly every leaf in one greenhouse.
Broome	60% plants in one greenhouse.
Livingston	Common.
Otsego	About 5% of loss in one ten-foot row.

Powdery mildew caused by Oidium sp.
Louisiana - this mildew is usually very common here in the spring; this is one of the few powdery mildews that will form the ascogenous stage in the state and is not always that this one does, March 6. (Edgerton)
+Wilt caused by Pythium spp.
Connecticut - forms two different fruiting bodies, the out of doors one being different from that of the greenhouse; Westport, Fairfield County, January. (Clinton & McCormick)
Rhizoctonia disease caused by Rhizoctonia sp.
Pennsylvania - found in greenhouse. (Thurston)
Washington - Walla Walla County. (Heald & Dana)
Prior reports: Connecticut, Massachusetts, Michigan, Minnesota, North Carolina and Ohio.
+Wilt caused by Sclerotium rolfsii Sacc.
Florida - caused the wilting and death of the host plant at St. Augustine and vicinity. (Weber)
Mosaic - cause undetermined
+New York - a local planting showed a 40% injury; Tompkins County, July 8. (Chupp)
+Wisconsin - a limiting factor in sweet pea culture; general about Madison and Racine where gardens have been examined; probably has been seen for some time; investigations on nature and comparison with other mosaic diseases is underway. (Vaughan & Jones)
+New Mexico - common on garden sweet peas in Mesilla Valley causing a dwarfing and stunting of the plants; caused a 5% reduction in yield. (Crawford)
Prior reports: Massachusetts, Ohio, Pennsylvania and *Virginia.
Wilt or stem rot - cause undetermined
South Carolina - important about Aiken, Aiken County, May 9. (Ludwig)
Soil trouble caused by excessive nitrogen
Washington - in a greenhouse. (Heald & Dana)

SNOWBERRY (Symphoricarpos racemosus)
Powdery mildew caused by Microsphaera diffusa Cke. & Pke.
*+Oregon - not uncommon; Odell, Hood River County, July 25. (Boyce)
Prior reports: *Idaho, New York and *Washington.

SNOWBERRY (Symphoricarpos sp.)
+Fruit rot caused by Botrytis sp.
New York - Ithaca, Tompkins County. (Chupp)
Powdery mildew caused by Microsphaera diffusa Cke. & Pk.
+New York - observed on Symphoricarpos racemosus and S. vulgaris; Wyoming County, August 24. (Chupp)
Prior reports: On the former in *Idaho, *Oregon and Washington, and on the latter in Indiana, *Kansas, *Missouri, Texas and *Virginia.

SYRINGA (Philadelphus sp.)
+Leafspot caused by Sphaeropsis syringae (Fr.) P. & C.
*New York - collected by W. D. Mills at Hicksville, Nassau County, August 10. (Chupp)

TULIP (Tulipa sp.)
Bulb rot caused by Botrytis sp.

Washington - found on stalk; bulbs from Holland, Whitman County. (Heald & Dana)

Botrytis blight caused by Botrytis tulipae (Lib.) Hop.

*New York - Whetzel reports "the fungus chiefly attacks base of stalk next to bulb after leaves are fully expanded; the leaves first turn purple then slowly wilt; bases of stalks deep in soil covered with the minute sclerotia; this purpling symptom appears not to have been noted by Hopkins"; Tompkins County, May 11. Kirby inspected the tulip planting at Rochester Park and found Botrytis on the following species:

fosturiana - 90% infected; 50% killed
greigi
hageri - 40% infected; none killed
primulina - 100% infected; 50% dead
gesneriana - 100% killed
linifolia
suaveolens
kaufmanniana - 80% infected; 30% killed
tubergiana - 100% killed

+Bulb rot caused by Rhizoctonia tuliparum (Klebahn) Whetzel & Arth. (Sclerotium tuliparum Klebahn)

New York - confined to tulip planting on an estate in Westchester County; 98% were destroyed in infested soil; this is probably the first report of this disease in America; common in Holland and Germany, April 29. (Chupp)

Recent literature:

Whetzel, H. H. and John M. Arthur. The grey bulb-rot of tulips. (Abstract) Phytopath. 14: 30. Jan. 1924.

Recent literature:

Mackintyre, P. Baroness. Tulip disease. Gard. 45: 381. June 1923.

VERBENA (Verbera sp.)

Powdery mildew caused by Erysiphe cichoracearum DC.

+New York - reported on Verbena hastata and V. urticaefolia, Genesee County, August 22. (Chupp)

Prior reports: For the former species, *District of Columbia, *Illinois, Iowa, Minnesota, Missouri, *Montana, *Ohio and *Wisconsin. For the latter, Alabama, Illinois, *Indiana, Iowa, *Kansas, Minnesota, Missouri, *New Jersey, *Ohio and *Pennsylvania.

+Mississippi - rather serious in several greenhouses in the state; Sunflower County, May 1.

VERONICA ARVENSIS

+Downy mildew caused by Peronospora grisea Ung.

New York - Tompkins County, June 10. Collected by H. H. Whetzel. (Chupp)

VIBERNUM (Viburnum sp.)

Bud galls cause undetermined.

New York - found in greenhouse; one patch in the border showed considerable infestation, December 4. Collected by R. E. Horsey. (Chupp)

VINCA (Vinca minor)

+Leafspot caused by Phyllosticta vincae-majoris Allesch.

New York - Monroe County, September 19. Collected by E. F. Guba. (Chupp)

VIOLET (Viola spp.)

Leafspot caused by Alternaria violae Gall. & Dorsett

**+New York - present in beds in greenhouses; E. F. Guba reports as follows: "causing spots and eventually killing entire blade; spots pale, beginning usually at the margins of the leaves." (Chupp)

+Mississippi - general; epidemic in some localities causing most of the leaves to be killed, Sunflower County, April 28.

Prior reports: *Georgia and *Maryland.

Leafspot caused by Cercospora violae Sacc.

**+New York - Otsego County, August 26. Collected by K. H. Fernow. (Chupp)

*Florida - collected at several places in Gainesville where it caused 20 to 60% defoliation. (Weber)

Prior reports: *Georgia, *Illinois, Iowa, *Louisiana, *Massachusetts, *Minnesota, *Nebraska, North Carolina, Ohio, Pennsylvania, *South Carolina and Texas.

+Leafspot caused by Colletotrichum violae-tricoloris Sm.

New York - Big Indian, Slide Mountain, Ulster County, June 10. Collected by E. F. Guba. (Chupp)

Leafspot caused by Marssonia violae (Pass.) Sacc.

+Minnesota - (Sect. Pl. Path.)

Prior reports: *Connecticut, *District of Columbia, New Jersey and *Vermont.

Leafspot caused by Phyllosticta violae Desm.

Florida - caused considerable spotting of leaves; not serious. (Weber)

+Alabama - unimportant; reported abundant each year in outdoor beds but controlled by repeated sprayings of Bordeaux mixture. (Miles)

+Kansas - on cultivated violets; slight importance; Kansas City, Wyandotte County, October 24. (White)

Prior reports: *California, Connecticut, Iowa, *Massachusetts, Minnesota, Nebraska, *New York and South Carolina.

Rust caused by Puccinia violae (Schum.) DC.

+New York - reported on the following species: +Viola canadensis, +V. papilionacea, and +V. striata; Ulster County, May 17. (Chupp)

Minnesota - Redwood County. (Sect. Pl. Path.)

Prior reports: Alabama, California, Colorado, Delaware, District of Columbia, Idaho, Illinois, Indiana, Iowa, Kansas, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, North Dakota, Ohio, Oregon, Pennsylvania, South Carolina, Utah, Vermont, Virginia, Washington, West Virginia, Wisconsin and Wyoming.

Mosaic - cause undetermined

New York - on the college campus; Ithaca, Tompkins County, September 8. Collected by E. F. Guba. (Chupp)

Prior report: California.

VIRGINIA CREEPER - See Ampelopsis quinquefolia

WEIGELIA (Weigelia sp.)

+Crown gall caused by Bacterium tumefaciens EFS. & Town.

Mississippi - light infection in a nursery; Coahoma County, April 27. (Neal & Barker)

+Root knot caused by Heterodera radicicola (Greef.) Muell.

Mississippi - heavy infection in nursery; Coahoma County, April 26. (Neal & Barker)

YUCCA (Yucca sp.)

Leafspot caused by Coniothyrium concentricum (Desm.) Sacc.

*+New York - reported on Yucca filamentosa; Suffolk County, June 1, Dutchess County, August 31. Collected by E. F. Guba. (Chupp)

Prior reports: *Idaho, Indiana, *Iowa, *New Jersey, *North Dakota and *Virginia.

ZINNIA (Zinnia elegans)

+Wilt caused by Bacterium sp.

Florida - destroyed plants in Orlando; was not reported elsewhere. (Weber)

Leafspot caused by Cercospora atricinota Heald & Wolf

+Florida - collected at Gainesville and Micanopy, where it was causing partial defoliation. (Weber). Prior report: *Texas.

Powdery mildew caused by Oidium sp.

South Carolina - unimportant. (Ludwig)

Florida - found to be very common on the host plant; it was the the factor limiting the longevity of blooming time; it was of much concern to florists. (Weber)

Texas - (Taubenhaus)

California - common; Santa Ana, September 5. (Harter & Weimer)

Miscellaneous literature reports:

Jones, S. G. Life history of Rhytisma acerinum (Preliminary account). Ann. Bot. 37: 731-732. Oct. 1923.

Wilson, Malcolm. Puccinia mirabilissima Pk. A new British Record. Trans. & Proc. Bot. Soc. Edinburgh 28: 164-167. 1923.

DISEASES OF MISCELLANEOUS PLANTS

ACORUS CALAMUS (Sweet Flag)

Leafspot caused by Septocylindrium aromaticum Sacc.

*+New York - Labrador Lake, Cortland County, June 30. Collected by H. H. Whetzel. (Chupp)

Prior reports: *Delaware and *New Jersey.

AGRIMONY (Agrimonia spp.)

Rust caused by Pucciniastrum agrimoniae (Diet.) Tranz.

*+New York - Madison County, August 25. Collected by K. H. Fernow. (Chupp)

Prior reports: *Arkansas, Connecticut, *Delaware, *District of Columbia, *Illinois, *Indiana, *Iowa, *Kansas, *Maryland, *Massachusetts, *Minnesota, *Mississippi, *Nebraska, *New Jersey, *New Mexico, *North Dakota, *Ohio, *Pennsylvania, *Vermont, *Virginia, *West Virginia and *Wisconsin

+Powdery mildew caused by Sphaerotheca humuli (DC.) Burr.

*New York - general; Erie County, June 25. (Chupp)

+Mosaic - cause unknown

New York - Nassau County, June 11. (Chupp)

AGROSTIS PALUSTRIS (Red Top)

Smut caused by Ustilago striaeformis (West.) Niessl.

*+New York - Ithaca, Tompkins County, May 17. Collected by R. S. Kirby. (Kirby)

Prior reports: *Illinois, Indiana, *Iowa, *Maryland, Minnesota and *Virginia.

ALLIUM TRICOCCUM (Wood Leak)
Leafspot caused by Septoria alliorum Westd. (S. viridi-tingens Curtis)
*+New York - found near Labrador Lake, Cortland County, June 3. Collected by H. H. Whetzel. (Chupp)
Prior reports: Minnesota and *North Dakota.

ALSINE, MEDIA
Leafspot caused by Septoria stellariae Rob. & Desm.
New York - Tompkins County, October 8. Collected by E. E. Honey. (Chupp)

ALTHAEA CANNABINA L. (Marsh-mallow)
+Ascochyta althaeina Sacc. & Biz.
*New York - common; caused defoliation of lower leaves; Dutchess County, August 31. Collected by E. F. Guba. (Chupp)

AMARANTHUS RETROFLEXUS (Green Amaranth) (Red Root)
White rust caused by Albugo bliti (Biv.) Kze., (Cystopus blite (Biv.) Lev.)
+New York - statewide; very common wherever the weed is found; Onondago County, June 30. (Chupp)
+New Jersey - Middlesex and Essex, September 25. (Dept. Pl. Path.)
+Mississippi - general; Oktibbeha County, June 24. (Neal & Barker)
+Florida - collected at Vero and Gainesville; caused partial defoliation of host. (Weber)
Minnesota - Brown County. (Sect. Pl. Path.)
+Oklahoma - prevalent, Payne County. (Stratton)
*+Colorado - unimportant; Larimer County, September. (Learn)
Prior reports: *Delaware, *Illinois, *Indiana, *Iowa, *Kansas, *Massachusetts, *Michigan, Minnesota, *Mississippi, *Nebraska, *New York, *North Dakota, *Ohio, *Oklahoma, *Oregon, Pennsylvania, *Texas, Washington, *West Virginia and *Wisconsin.

AMARATHUS SP.
+Downy mildew caused by Peronospora amaranti Ell. & Ev.
New York - common; 5 to 10% infected; Niagara County, June 3. Collected by F. R. Perry. (Chupp)

AMBROSIA, ELATIOR (Rag Weed) (Ambrosia artemisiaefolia)
Smut caused by Entyloma compositarum Farl.
+New York - Seneca County, June 29. (Chupp)
Prior reports: Maine and Massachusetts.
Erysiphe cichoracearum DC.
Prior reports: Alabama, *District of Columbia, *Illinois, *Indiana, Iowa, *Kansas, *Maryland, Minnesota, *Mississippi, *Missouri, *Nebraska, *New Jersey, *New York, Ohio, *Pennsylvania and Texas

AMBROSIA, PSILOSTACHYA (Western Ragweed)
Rust caused by Puccinia xanthii Schw.
+Minnesota - Anoka County. (Sect. Pl. Path.)
Prior reports: *Colorado, *Kansas, *Montana, *Nebraska and *North Dakota.

AMBROSIA TRIFIDA (Great Ragweed)
+Downy mildew caused by Plasmopara halstedii (Farl.) B. & de T.
Minnesota - Brown, Cottonwood and Waseca Counties. (Sect. Pl. Path.)
Prior reports: *Illinois, *Indiana, Iowa, *Kansas, *Maryland, *Missouri, *Virginia and *Wisconsin.

AMBROSIA SPP.
Powdery mildew caused by Erysiphe cichoracearum DC.
*+New York - reported on Ambrosia elatior and A. trifida; Tompkins County, August 30. (Chupp)
+New Jersey - New Brunswick, Middlesex County, September 4. (Dept. Pl. Path.)
Prior reports: On the former in Illinois and Mississippi, and on the latter in Alaska, *Illinois, *Indiana, Iowa, *Kansas, Minnesota, Mississippi, Missouri, *Nebraska, North Dakota, Ohio, *South Dakota, Texas and *West Virginia.
Dodder - Cuscuta gronovii Willd.
+New York - observed on Ambrosia elatior and A. trifida; found in western part of state; Genesee County, June 27. (Chupp)

AMPHICARPA MONOICA (Hog Peanut)
+Powdery mildew caused by Erysiphe polygoni DC.
New York - Oswego County, September 10. (Chupp)
Rust caused by Synchytrium decipiens Farl.
*+New York - common wherever the hog peanut grows; Tompkins County, June 1. (Chupp)
Prior reports: *Mississippi and *Virginia.

ANEMONE CANADENSIS (Meadow Anemone)
Downy mildew caused by Peronospora pygmaea Unger
*+New York - Tompkins County, May 20. Collected by M. F. Barrus. (Chupp)
Prior report: North Dakota.

ANEMONE NEMOROSA (European Wood Anemone)
Rust caused by Puccinia fusca (Pers.) Wint.
*+New York - Nassau County, June 10. Collected by W. D. Mills. (Chupp)
Prior reports: *Massachusetts, *Michigan, *Ohio, *Virginia and *Wisconsin.

ANEMONE QUINQUEFOLIA (American Wood Anemone)
Rust caused by Puccinia fusca (Pers.) Wint.
+Minnesota - Pine and Isanti Counties. (Sect. Pl. Path.)
Prior reports: *Delaware, *Indiana, *Iowa, *Michigan, *New York, *Ohio and *Wisconsin.

ANEMONE VIRGINIANA (Tall Anenome)
Smut caused by Urocystis anemone (Pers.) Wint.
*+New York - Tompkins County, May 20. Collected by M. F. Barrus. (Chupp). Prior reports: Iowa and Texas.

APOCYNUM ANDROSAEMIFOLIUM (Spreading Dogbane)
Leafspot caused by Phyllosticta apocyni Trel.
+New York - Tompkins County, July 4. Collected by Guba and Honey. (Chupp). Prior report: Iowa.

ARCTIUM SPP. (Burdock)

+Leaf blotch caused by Bacillus sp.

*New York on Arctium lappa; Poplar Ridge, Cayuga County, May 28. Collected by D. Reddick. (Chupp)

Rust caused by Puccinia bardanae Cda. (Bullaria bardanae (Cda.) Arth.

*+New York - reported on Arctium lappa and A. minus; Tompkins County, September 11. (Chupp)

Prior reports: On the former species in the *District of Columbia, Indiana, *Virginia and *West Virginia, and on the latter in *Connecticut, *Illinois, *Indiana, *Kentucky, *Michigan, *Missouri, *North Dakota, *Ohio and *Wisconsin.

+Mosaic - cause undetermined

New York - reported on Arctium lappa and A. minus; Niagara County, June 3. (Chupp)

ARISAEMA STEWARDSONII (Stewardson Brown's Indian Turnip)

*+Rust caused by Uromyces arisaemae Cke. (Uromyces caladii Farl.)

New York - Cortland County, June 30. Collected by H. H. Whetzel. (Dept. Pl. Path.)

ARISAEMA TRIPHYLLUM (Jack-in-the-pulpit)

+Blight caused by Botrytis sp.

New York - Dutchess County, June 16. Collected by Kirby and Honey. (Chupp)

Rust caused by Uromyces arisaemae Cke.

*+New York - Ithaca, Tompkins County, May 14. Collected by Cynthia Westcott. (Dept. Pl. Path.)

Prior reports: Connecticut, *Delaware, *District of Columbia, Florida, *Georgia, *Illinois, *Indiana, *Iowa, *Kansas, Kentucky, *Maine, *Maryland, *Massachusetts, *Michigan, *Minnesota, Mississippi, *Missouri, *Nebraska, New Hampshire, New Jersey, North Carolina, *North Dakota, *Ohio, *Pennsylvania, Rhode Island, *South Carolina, *South Dakota, Vermont, *Virginia, *West Virginia and *Wisconsin.

ARUM SP. (Arum)

Recent literature:

Cornhill, J. Diseased arums. Gard. Illus. 45: 626. 1923.

ASARUM CAUDATUM (Wild Ginger)

Rust caused by Puccinia asarina Kze.

+British Columbia - is not uncommon; Daisy Lake, August 22. (Boyce)

Prior reports: *California, *Oregon and *Washington.

ASARUM SP. (Wild Ginger)

+Root and stem rot caused by Sclerotinia sclerotiorum (Lib.) Mass.

New York - Cortland County, May 19. Collected by K. F. Fernow. (Chupp)

ASCLEPIAS SP. (Milkweed)

Rust caused by Aecidium brandegei Pk. (A. jamesianum Pk.) (Puccinia bartholomaei Diet.)

+South Dakota - (Evans)

Prior reports: *Iowa, *Kansas, *Nebraska and *New York.

+Mosaic - cause unknown
*New York - reported on Asclepias cornuti; Tompkins County, June 15. Collected by D. Reddick. (Chupp)

Flagellate infection
Recent literature:
Holmes, Francis O. A flagellate infection of milkweeds in Maryland. (Abstract) Phytopath. 14: 54. Jan. 1924.

ASTER CAESIA
+Rust caused by Coleosporium solidaginis (Schw.) Thuem.
*New York - east shore of Cayuga Lake, Ithaca, Tompkins County, May 19. Collected by M. F. Barrus. (Dept. Pl. Path.)

ASTER PANICULATUS (Tall White Aster)
+Dodder - Cuscuta gronovii Willd.
New York - Tompkins County, September 1. Collected by E. E. Honey. (Chupp)

ASTER PUNICEUS (Swamp Aster)
Rust caused by Puccinia asterum (Schw.) Kern
*+New York - Ithaca, Tompkins County, May 20. Collected by M. F. Barrus. (Dept. Pl. Path.) Prior report: Indiana.

ASTER (Schreberi)?
Rust caused by Coleosporium solidaginis (Schw.) Thuem.
+New York - Ithaca, Tompkins County, May 10. Collected by M. F. Barrus. (Dept. Pl. Path.)

ASTER SPP.
+Powdery mildew caused by Erysiphe cichoracearum DC.
New York - reported on Aster laevis, A. lateriflorus, A. novae-angliae, A. paniculatus, A. puniceus; Wyoming County, August 24. (Chupp)
Black knot caused by Montagnella heliopsidis (Schw.) Sacc.
New York - Tompkins County, May 7. Collected by H. M. Fitzpatrick. (Chupp)
+Phyllachora haydeni (B. & C.) Dearness
*Iowa - college nursery, Grinnell. Collected by H. S. Conard, September. (Conard)
Rust caused by Puccinia asterum (Schw.) Kern
New York - statewide; reported on Aster puniceus; +A. paniculatus; +A. corymbosus; Tompkins County, May 20. (Chupp)

ATRIPLEX HASTATA
+Leafspot caused by Ascochyta atriplicis Lasch.
New York - Tompkins County, September 1. Collected by E. E. Honey. (Chupp)
+Leafspot caused by Ramularia dubia Riess
New York - Tompkins County, September 1. Collected by E. E. Honey. (Chupp)

BARBAREA VULGARIS (Wintercress)
+Dodder - Cuscuta gronovii Willd.
New York - Orleans, Ontario County, June 27. Collected by Kirby and Honey. (Chupp)

Leafspot caused by Ramularia barbareae Pk.
*+New York - general; Livingston County, May 15. (Chupp)
Prior reports: *Massachusetts, *New Jersey and *Ohio.

BIDENS FRONDOSA (Beggar Ticks)
Powdery mildew caused by Sphaerotheca humuli var. filiginea (Schlecht.) Salm.
+New York - Tompkins County, August 30. (Chupp)
Prior reports: Indiana, Iowa and Ohio.

BRASSICA ARVENSIS (Charlock)
White rust caused by Albugo candida (Pers.) Kuntze.
+New York - Orleans County, June 26. (Chupp)
Prior reports: *Colorado, Iowa, *Kansas, *Missouri, *Nebraska, New York and *North Dakota.

BURSA BURSA-PASTORIS (Shepherds Purse)
White rust caused by Albugo candida (Pers.) Kuntz.
*+New York - common; Chenango County, June 14. (Chupp)
+Colorado - Ft. Collins, Larimer County, May. (Learn)
Prior reports: California, Colorado, *Delaware, *District of Columbia, Georgia, *Idaho, *Illinois, *Indiana, Iowa, *Kansas, *Maine, *Massachusetts, *Michigan, Minnesota, Mississippi, Missouri, *Montana, *New Jersey, *New York, *North Dakota, Iowa, *Ohio, Oklahoma, Washington and *Wisconsin.
Downy mildew caused by Peronospora parasitica (Pers.) DeBy.
+Colorado - Ft. Collins, Larimer County, July. (Learn)
Prior reports: Indiana, Iowa, Kansas and New Hampshire.

CALLICARPA AMERICANA (American Beautyberry)
Leafspot caused by Cercospora callicarpae Cke.
*+Mississippi - A. & M. College, September 1. Collected by H. D. Barker. Prior reports: *Florida and *Texas.

CALTHA PALUSTRIS (Marsh Marigold)
+Leafspot caused by Cylindrosporium sp.
*New York - Labrador Lake, Onondaga County, June 3. Collected by M. F. Barrus. (Chupp)
Rust caused by Puccinia calthae Link
*+New York - Labrador Lake, Cortland County, June 3. Collected by M. F. Barrus. (Chupp)
Prior reports: Indiana, *Iowa, *Michigan, *North Dakota, *Pennsylvania and *Wisconsin.

CAMPANULA GLOMERATA (Danesblood)
Leafspot caused by Phyllosticta alliariaefoliae Allesch.
+New York - Tompkins County, September 8. Collected by E. F. Guba. (Chupp). Prior report: New Jersey.

CANNABIS SATIVA (Hemp)
Botrytis sp.
Oregon - Salem, Marion County, July. (Dewey)
Virginia - Arlington Farm; this seems to be a new hemp disease.

CAREX PENNSYLVANICUM (Pennsylvania Sedge)
Smut caused by Schizonella melamogramma (DC.) Schroet.
*+New York - slight; Ithaca, Tompkins County, May 10. Collected by H. H. Whetzel. (Kirby)
Prior reports: Colorado, Connecticut, *Illinois, Indiana, *Iowa, *Massachusetts, *Michigan, *North Dakota and Wisconsin.

CAREX STRICTA (Tussock Sedge)
Smut caused by Cintractia caricis (Pers.) Magn.
*+New York - Labrador Lake, Onondaga County, June 30. Collected by H. H. Whetzel. (Whetzel). Prior reports: Nebraska and Wisconsin.

CAREX SP. (Sedge)
Rust caused by Puccinia caricis (Schum.) Reb.
+New York - abundant; Ithaca, Tompkins County, July 21. Collected by E. E. Honey. (Kirby)

CEANOTHUS AMERICANUS (Jersey-tea)
Powdery mildew caused by Microsphaera alni (Wallr.) Wint.
*+New York - Schuyler County, August 2. Collected by Kirby and Honey. (Chupp).
Prior reports: Connecticut, *Illinois, *Minnesota and *Virginia.

CELASTRUS SCANDENS (American Bittersweet)
Powdery mildew caused by Phyllactinia corylea (Pers.) Karst.
*+New York - Tompkins County, October 5. Collected by R. S. Kirby. (Chupp)
Prior reports: Indiana, *Kansas, *Nebraska, *Ohio and *South Dakota.
+Fly speck - cause undetermined
New York - Tompkins County, July 4. Collected by E. E. Honey. (Chupp)

CEPHALANTHUS OCCIDENTALIS (Common Buttonbush)
+Dodder - Cuscuta gronovii Willd.
New York - Tompkins County, September 1. (Chupp)

CENCHRUS ECHINATUS (Sandbur)
+Rust caused by Puccinia cenchri Diet. & Holw.
Florida - common; not important. (Weber)
Bud blight caused by Ephelis mexicana Fr.
Recent literature:
Weber, George F. Ephelis mexicana Fr., Balansia hypoxylon (Pk.) Atk. on Sandbur, (Cenchrus echinatus L.) (Abstract) Phytopath. 14: 66. Jan. 1924.
+Leafspot caused by Phyllochora sphaerosperma Wint.
Florida - killed the older leaves; common on poor soil. (Weber)

CHAETOCHLOA GLAUCA
Smut caused by Ustilago panici-glauci Wint. (U. neglecta Niessl.)
*New York - Ithaca, Tompkins County, September 11. Collected by R. S. Kirby. (Kirby)

CHAMAECYCE HIRSUTA
*+Rust caused by Uromyces proeminens (DC.) Lev.
New York - Tompkins County, August 31. Collected by R. S. Kirby. (Chupp)

CHAMAECYCE MACULATA
**+Rust caused by Uromyces proeminens (DC.) Lev.

CHAMAECYCE POLYGONIFOLIA
Rust caused by Uromyces euphorbiae Cke. & Pk.
**+Iowa - Lakeside Laboratory, Lake Okoboji, Dickinson County. Collected by H. S. Conard, July 16. (Conard).
Prior report: Mississippi.

CHAMAEDAPHNE CALYCULATA (Leatherleaf)
Leafspot caused by Venturia pulchella Cke. & Pk.
+New York - east side Labrador Lake, Onondaga County, May 19; sp. questioned. Collected by E. E. Honey. (Chupp)
Prior reports: *New Hampshire, *New Jersey and *Wisconsin.

CHELONE GLABRA (White Turtlehead)
Powdery mildew caused by Erysiphe galeopsidis DC.
**+New York - Tompkins County, August 11. (Chupp)
Prior reports: *Delaware and Ohio.
+Fly speck - cause undetermined
New York - Ontario County, September 22. (Chupp)

CHENOPODIUM ALBUM (White Goosefoot)
+White rust caused by Albugo candida (Pers.) Kuntze.
Mississippi - Tunica County, April 30. (Neal & Barker)
Downy mildew caused by Peronospora effusa (Grev.) Rabh.
**+New York - Nassau County, June 9. (Chupp) Walton, Delaware County, July 11. Collected by Anna E. Jenkins. (Jenkins)
Minnesota - Hennepin and Cottonwood Counties. (Sect. Pl. Path.)
Prior reports: *District of Columbia, *Illinois, *Indiana, *Iowa, *Kansas, *Massachusetts, *Michigan, *Mississippi, *North Dakota, *Ohio, *Virginia and *Washington.

CHRYSANTHEMUM PARTHENIUM (Feverfew)
Powdery mildew cause undetermined
New York - no report of a mildew on this host either in Salmon's monograph or in the Plant Pathology herbarium; found at Castile, Wyoming County, August 25. (Chupp)

CIRCAEA LUTETIANA (Enchanters Nightshade)
Rust caused by Puccinia circaeae Pers.
**+New York - Renwick Swamp, Tompkins County, July 21. Collected by E. E. Honey. (Chupp)
Prior reports: *California, *District of Columbia, *Illinois, *Indiana, *Iowa, *Kansas, *Maine, *Maryland, *Massachusetts, *Michigan, *Minnesota, *Mississippi, *Nebraska, *New Jersey, *North Dakota, *Ohio, *Oregon, *Pennsylvania, *Vermont, *Virginia, *Washington, *West Virginia and *Wisconsin

CIRCAEA PACIFICA (Enchanters Nightshade)
Rust caused by Puccinia circaeae Pers.
+British Columbia - Daisy Lake, August 31. (Boyce)
Prior reports: *Idaho and *Washington.

CIRSIUM ARVENSE (Canada Thistle)

White rust caused by Albugo tragopogonis (Pers.) Gray

*+New York - Onondaga County, September 3. Collected by K. Fernow. (Dept. Pl. Path.)

Prior reports: Minnesota and *South Dakota.

Dodder - Cuscuta sp.

+New York - Genesee County, June 27. Collected by Kirby and Honey. (Chupp)

Rust caused by Puccinia obtegens (Lk.) Tul.

*+New York - statewide; infection became severe between June 15 and June 24; Cortland County, June 3.

Prior reports: *Pennsylvania, *South Dakota and *Wisconsin.

Rust caused by Puccinia suaveolens (Pers.) Rostr.

*+New York - collected by D. Reddick, May 21. (Chupp)

Prior reports: *Maine, *Massachusetts, *New Jersey, Utah and *Vermont.

+Leafspot caused by Septoria cirsii Neissel.

New York - Monroe County, June 9. (Chupp)

CIRSIUM MUTICUM

White rust caused by Albugo tragopogonis (Pers.) Gray

+New York - Tompkins County, August 11. (Chupp). Prior report: *Ohio.

CLAYTONIA CAROLINIANA (Carolina Spring Beauty)

+Rust caused by Puccinia claytoniata (Schw.) Syd.

*New York - Ithaca, Tompkins County, May 19. Collected by M. F. Barrus. (Dept. Pl. Path.) Walton, Delaware County, May 5. Collected by Anna E. Jenkins. (Jenkins)

CODIAEUM VARIEGATUM (Croton)

+Leafspot caused by Gloeosporium sp.

Florida - common over the state. (Weber)

CODIAEUM SP. (Croton)

+Gloeosporium crotonis Del.

New Jersey - Riverton, August 4. (Dept. Pl. Path.)

COMMANDRA UMBELLATA (Bastard Toad Flax)

+Rust caused by Puccinia andropogonis Schw.

*Iowa - Dickinson County, June 23. Collected by H. S. Conard. (Conard)

COMARUM PALUSTRE

Mosaic - cause undetermined

New York - Onondaga County, September 15. (Chupp)

CONVOLVULUS SEPIUM (Hedge Bindweed)

+Dodder - Cuscuta gronovii Willd.

New York - Tompkins County, September 1. Collected by E. E. Honey. (Honey)

Rust caused by Puccinia convolvuli (Pers.) Cast.

*+New York - Livingston County, July 14. Collected by R. S. Kirby. (Chupp)

Prior reports: *Delaware, *District of Columbia, *Illinois, *Indiana, *Iowa, *Kansas, *Maryland, *Massachusetts, *Michigan, *Minnesota, *Mississippi, *Missouri, *Montana, *Nebraska, *New Jersey, *North Dakota, *Ohio, *Virginia, *West Virginia and *Wisconsin.

CORNUS CANADENSIS (Bunchberry)
Rust caused by Puccinia porphyrogenita Curt.
+British Columbia - Vancouver, August 19. (Boyce)
Prior reports: *Idaho, *Maine, *Minnesota, *New Hampshire, *New York, *Oregon and *Washington.

CYPERUS STRIGOSUS (Straw Colored Cyperus)
Rust caused by Puccinia cyperi Arth.
*+Iowa - Dickinson County, August 9. Collected by H. S. Conard. (Conard). Prior reports: Indiana and *New York.

DECODON VERTICILLATUS (Water Willow)
Rust caused by Puccinia minutissima Arth.
*+New York - very abundant; distorted the plants growing in water along the shore; Suffolk County, June 21. Collected by M. F. Barrus. (Chupp)
Prior reports: *Delaware, Indiana, *Massachusetts, *New Jersey, *Ohio and *Wisconsin.

DENTARIA DIPHYLLA (Crinkleroot)
White rust caused by Albugo candida (Pers.) Kuntze.
*+New York - Tompkins County, May 3. (Chupp)
Prior report: Indiana.

DENTARIA LACINIATA (Cut Toothwort)
Downy mildew caused by Peronospora parasitica (Pers.) D By.
*+New York - Tompkins County, May 13. Collected by M. F. Barrus. (Chupp)
Prior reports: *Delaware, *District of Columbia, *Illinois, Indiana, Iowa, *Maryland, *Ohio, *Virginia and *Wisconsin.

DICENTRA CANADENSIS (Squirrel Corn)
Downy mildew caused by Peronospora corydalis D By.
*+New York - Ithaca, Tompkins County, May 8. Collected by M. F. Barrus. (Dept. Pl. Path.)
Prior reports: *District of Columbia and *Indiana.

DICENTRA CUCULLARIA (Dutchmans Breeches)
Downy mildew caused by Peronospora corydalis D By.
*+New York - Ithaca, Tompkins County, May 13. Collected by M. F. Barrus. Prior report: Indiana.

DIODIA TERES (Button Weed)
Rust caused by Uromyces spermacoces (Schw.) Thuem.
*+Mississippi - Oktibbeha County, September 15. (Neal & Barker)
Prior reports: *Alabama, *Arkansas, Delaware, *District of Columbia, *Florida, *Georgia, *Illinois, *Indiana, *Kansas, *Maryland, *Missouri, *New Jersey, North Carolina, *Oklahoma, *South Carolina, Tennessee, *Texas, *Virginia and *West Virginia.

ECHINOCYSTIS LOBATA (Mock Cucumber)
+Mosaic - cause unknown
New York - Wyoming County, August 24. Collected by E. F. Guba. (Chupp)

ELEPHANTOPUS TOMENTOSUS (Woolly Elephants-foot) (Tobacco Weed)
Rust caused by Coleosporium elephantopodis (Schw.) Thuem.
*+Florida - collected near Gainesville, October 1922. (Weber)
Prior reports: Alabama, *Arkansas, *Georgia, *Louisiana, Mississip. South Carolina, *Texas and Virginia.

EPILOBIUM ANGUSTIFOLIUM (Fireweed)
Fir-fireweed rust caused by Pucciniastrum pustulatum (Pers.) Diet.
*+Oregon - abundant, Waldport, Lincoln County, October 10. (Boyce)
Prior reports: *Colorado, Idaho, *Montana, *New York, *North Dakota, *Washington and *West Virginia.

ERECHTITES HIERACIFOLIA (Fireweed)
+Powdery mildew caused by Erysiphe polygoni DC.
New York - Tompkins County, September 1. Collected by E. E. Honey. (Chupp)

ERIGERON ANNUUS (Sweet Scabious) (White-top)
Rust caused by Puccinia caricis-erigerontis Arth.
+New York - Cortland County, August 20. Collected by R. S. Kirby. (Chupp). Prior reports: Iowa and *Missouri.

ERIGERON SP. (Fleabane)
Leafspot caused by Septoria erigerontis B. & C.
+New York - Wyoming County, August 14. Collected by E. F. Guba. (Chupp)
Prior reports: Indiana, *Maryland and *Ohio.

ERYTHRONIUM AMERICANUM (Adder's Tongue) (Common Trout-lily)
Smut caused by Ustilago heufleri Fckl. (U. erythronii Clint.) (U. tulipae Wint.)
*+New York - swamps; Ithaca, Tompkins County, May 6. Collected by Honey and Perry. (Chupp)
Prior reports: *Delaware, *District of Columbia, Maryland, Missouri, New Jersey and *Pennsylvania.

ERYTHRONIUM SP. (Adder's Tongue)
+Blight caused by Botrytis sp.
New York - Cortland County, May 19. Collected by E. E. Honey. (Chupp)

EUPATORIUM PERFOLIATUM (Boneset)
Rust caused by Puccinia eleocharidis Arth. (Aecidium compositarum euportii Det.) (Dicaeoma eleocharidis (Arth.) Kuntze)
*+New York - very common and injurious near Sag Harbor, Suffolk County, June 21. Collected by M. F. Barrus. (Chupp)
*+Iowa - Dickenson County, June 23. Collected by H. S. Conard. (Conard)
Prior reports: Indiana and *Nebraska.

EUPATORIUM PURPUREUM (Joe-Pye-Weed)
Powdery mildew caused by Erysiphe cichoracearum DC.
+New York - Onondaga County, September 15. (Chupp)
Prior reports: *Connecticut, Illinois, *Indiana and *Wisconsin.

EUPATORIUM URTICAEFOLIUM (Snow Thoroughwort)
Powdery mildew caused by Erysiphe cichoracearum DC.
*+New York - Onondaga County, September 15. (Chupp)

Prior reports: *District of Columbia, Iowa and *Nebraska.
Rust caused by Puccinia tenuis (Schw.) Burr.
**+New York - Cortland County, June 30. Collected by H. H. Whetzel. (Chupp). Prior reports: *Illinois, Indiana, *Massachusetts, Ohio, Pennsylvania and *Wisconsin.

EUPHORBIA SPP. - See Chamaesyce spp.

EUTHAMIA GRAMINIFOLIA
Rust caused by Puccinia caricis-solidaginis Arth.
*New York - statewide; Onondaga County, June 3. (Chupp)
Prior report: Iowa.

FICUS SP. (Banyan)
+Leafspot caused by Rhytisma sp.
Florida - caused almost a complete defoliation of host when affected; not common. (Weber)

FLOERKEA PROSERPINACOIDES (False Mermaid)
White rust caused by Entyloma floerkeae Holw.
**+New York - Labrador Lake, Cortland County, May 19. Collected by H. H. Whetzel. (Chupp)
Prior reports: *Delaware, Indiana, Ohio, *West Virginia and *Wisconsin.

GALEOPSIS TETRAHIT var. BIFIDA (Hemp Nettle)
+Leafspot caused by Septoria galeopsidis West.
New York - Big Indian, Slide Mountain, Ulster County, June 7. Collected by E. F. Guba. (Chupp)

GAULTHERIA PROCUMBENS (Wintergreen, Checkerberry)
Asterina gaultheriae Curt.
**+New York - Riverhead, Suffolk County, June 1. Collected by L. M. Massey and E. F. Guba. (Chupp)
Prior reports: *Connecticut, *Maine, *Massachusetts and *Wisconsin.
Leafspot caused by Phyllosticta gaultheriae Ell. & Ev.
**+New York - Suffolk County, May 29. Collected by E. F. Guba. (Chupp)
Prior report: *New Jersey.

GAURA BIENNIS (Biennial Gaura)
+Leafspot caused by Cercospora gaurae Kell. & Sw.
New York - Tompkins County, September 11. Collected by Kirby and Honey. (Chupp)

GERANIUM MACULATUM (Wild Geranium)
Rust caused by Puccinia polygoni-amphibii Pers.
**+New York - Tompkins County, July 4. (Chupp)
Prior reports: *Indiana, Iowa, Minnesota, *Mississippi and *Wisconsin.

GERANIUM ROBERTIANUM (Herb Robert)
Stigmatea robertiana Fr.
**+New York - Tompkins County, May 8. Collected by H. H. Whetzel. (Chupp). Prior report: *Massachusetts.

HELIANTHUS LONGIFOLIUS (Sunflower)
+*Erysiphe cichoracearum* DC.
New York - Nassau County, August 10. Collected by W. D. Mills. (Dept. Pl. Path.)

HELIANTHUS SCABERRIMUS (Prairie Sunflower)
Plasmopara halstedii (Farl.) B. & DeT.
*+New York - Westbury, Nassau County, August 10. Collected by W. D. Mills. (Dept. Pl. Path.). Prior report: *Nebraska.

HELIOPSIS SCABRA (Rough Heliopsis)
+*Puccinia helianthi* Schw.
*Iowa - Dickinson County, June 23. Collected by H. S. Conard. (Conard)

HEPATICA ACUTILOBA (Sharplobe Hepatica)
Downy mildew caused by *Plasmopara pygmaea* (Ung.) Schroet.
+New York - Onondaga County, May 20. (Chupp)
Prior reports: Iowa and *Wisconsin.

HEPATICA TRILOBA (Roundlobe Hepatica)
+*Downy mildew* caused by *Plasmopara pygmaea* (Ung.) Schroet.
*New York - Tompkins County, May 7. (Chupp)
Rust caused by *Tranzschelia punctata* (Pers.) Arth.
+New York - Tompkins County, May 2. Collected by H. H. Whetzel. (Chupp)
Prior reports: Delaware, Indiana and Pennsylvania.

HEPATICA SPP.
Smut caused by *Urocystis anemones* Pers.
*+New York - Tompkins County, May 6; reported on *H. triloba* and *H. acutiloba*. (Chupp)
Prior reports: On the former in Missouri, and on the latter in *Illinois, Indiana, Iowa, Minnesota and *Wisconsin.

HESPERIS MATRONALIS (Dames Rocket)
+*Downy mildew* caused by *Peronospora parasitica* (Pers.) D By.
New York - Tompkins County, July 8. Collected by H. H. Whetzel. (Chupp)

HIBISCUS SABDARIFFA (Roselle)
Anthracnose caused by *Colletotrichum* sp.
Florida - locally destructive; Vero, St. Lucie County. (Weber)

HUMULUS LUPULUS (Hop)
+*Anthracnose* caused by *Colletotrichum* sp.
New York - quite common; 80% of plants infected, but only on a few leaves per plant; Oneida County, June 19. (Chupp)
Powdery mildew caused by *Sphaerotheca humuli* (DC.) Burr.
New York - common where sulfur dusting is not practiced; trace to 5% reduction in yield. (Chupp)
+*Mosaic* - cause unknown
New York - Oneida County, June 19. (Chupp)
Recent literature:
Salmon, E. S. and H. Wormald. A new *Cercospora* on *Humulus*. Jour. Bot. 61: 134-136. May 1923.

______________________ Three new diseases of the hop. Jour. Min. Agr. Gt. Brit. 30: 430-435. Aug. 1923. Downy mildew (Pseudoperonospora humuli, Miyabe and Takah.), Hop leafspot, Hop-drop.

HYDROCOTYLE VULGARIS (Marsh Pennywort)
+Rust caused by Puccinia hydrocotyles (Lk.) Cke.
Florida - very common. (Weber)

HYDROPHYLLUM VIRGINIANUM (Virginia water-leaf)
Downy mildew caused by Peronospora hydrophylli Waite
*+New York - Enfield Gorge, Ithaca, Tompkins County, May 13. (Chupp)
Prior reports: *Illinois, Iowa and *Wisconsin.
+Rust caused by Puccinia apocrypta Ell. & Tr.
Iowa - Poweshiek County, May 22. Collected by H. S. Conard. (Conard)

HYPERICUM VIRGINICUM - See Triadenum virginicum

IMPATIENS BIFLORA (Spotted Snapweed)
Downy mildew caused by Plasmopara obducens Schroet.
*+New York - Labrador Lake, Cortland County, May 19. Collected by H. H. Whetzel. (Dept. Pl. Path.)
Prior report: *Indiana.
+Rust caused by Puccinia perminuta Arth.
*Iowa - Dickinson County. Collected by H. S. Conard, July 4. (Conard)

IMPATIENS PALLIDA
Downy mildew caused by Plasmopara obducens Schroet.
+New York - Cortland County, May 19. (Chupp). Prior report: *Alabama.

IMPATIENS SP. (Snapweed)
Dodder - Cuscuta gronovii Willd.
+New York - Orleans County, June 27. (Chupp)
Rust caused by Puccinia impatientis (Schw.) Arth.
*+New York - Orange County, June 17. (Chupp)
Prior reports: *Delaware, *District of Columbia, *Illinois, *Indiana, *Iowa, *Kansas, *Maryland, *Minnesota, *Mississippi, *Missouri, *Nebraska, *Ohio, *Pennsylvania and *South Dakota.

INULA HELENIUM (Elecampane)
Powdery mildew caused by Erysiphe cichoracearum DC.
*+New York - Tompkins County, August 11. (Chupp)
Prior report: Wisconsin.

JUNCOIDES CAMPESTRE (Luzula campestris) (Common Wood-rush)
Rust caused by Puccinia campestris Schroet. (Dicaeoma obscurum (Schroet.) Kuntze)
*+New York - Tompkins County, May 10. Collected by H. H. Whetzel. (Chupp). Prior reports: Indiana, *Kansas, *Massachusetts and *Ohio.

LACTUCA CANADENSIS REGEL (Wild Lettuce)
Downy mildew caused by Bremia lactucae
+New York - Putnam County, June 17. (Chupp)
Prior reports: Illinois, Iowa, Kansas, Kentucky, Nebraska and North Carolina.

LACTUCA VIROSA (Prickley Wild Lettuce), (L. scariola)
+Dodder - Cuscuta gronovii Willd.
New York - Genesee County, June 27. (Chupp)
+Powdery mildew caused by Erysiphe cichoracearum DC.
New York - Tompkins County, September 14. (Chupp)

LEPIDIUM CAMPESTRE (Field, Cow or Bastard Cress)
White rust caused by Albugo candida (Pers.) Kuntze
*+New York - Tompkins County, July 14. Collected by H. H. Whetzel. (Chupp). Prior report: Indiana.

LEPIDIUM SP. (Pepper Grass)
Downy mildew caused by Peronospora parasitica (Pers.) D By.
+Florida - collected on this host in Gainesville, bordering a cabbage patch infected with the disease; the disease was plentiful and disasterous on this host. (Weber)
Prior report: North Dakota.

LEUCOTHOE AXILLARIS (Downy Leucothoe)
+Leafspot caused by Venturia sp.
New York - Monroe County, September 21. (Chupp)

LILIUM SPP.
Rust caused by Uromyces holwayi Lagh.
New York - Onondaga County, May 19. (Chupp). Reported on Lilium canadense and L. philadelphicum.
Prior reports: On the former in Maine and on the latter in New Hampshire.

LUZULA CAMPESTRIS - See Juncoides campestre

LUZULA SP. (Wood Rush)
+Rust caused by Puccinia oblongata (Lk.) Wint. (P. luzuli)
*New York - June 10. Collected by W. D. Mills. (Dept. Pl. Path.)

LYCHNIS DIOICA (Red Campion)
+Rust caused by Uromyces lychnidis Tr. & Earle
New York - Tompkins County, September 20. (Chupp)

LYCOPUS UNIFLORUS (Bugleweed)
+Rust caused by Puccinia angustata Pk.
*New York - Onondaga County, June 30. Collected by H. H. Whetzel. (Dept. Pl. Path.)

MALVA ROTUNDIFOLIA (Dwarf or Running Mallow)
Leafspot caused by Macrosporium malvae Thuem.
+New York - Jamaica, Queens County, June 11, and Monroe County, August 22. Collected by K. H. Fernow. (Chupp)
Prior report: Indiana.
Rust caused by Puccinia malvacearum Mont.
New York - statewide; Tompkins County, May 29. (Chupp)
Prior reports: Arizona, California, Colorado, Connecticut, Delaware, Indiana, Maine, Massachusetts, Michigan, New Jersey, New Mexico, Oregon, Pennsylvania, Utah, Vermont, Virginia, Washington, West Virginia and Wisconsin.

+Leafspot caused by Septoria heterochroa Desm.
New York - Wayne County, July 10. (Chupp)

MALVA SP. (Mallow)
Rust caused by Puccinia malvacearum Mont.
+New York - Steuben County, September 6. Collected by M. F. Barrus. (Dept. Pl. Path.)
+Colorado - Ft. Collins, Larimer County, September. (Learn)
Prior reports: California, New Jersey, Oregon and Virginia.

MEIBOMIA CANADENSIS (Desmodium canadensis) (Tick Trefoil)
Powdery mildew caused by Microsphaera diffusa Cke. & Pk.
*+New York - Tompkins County, July 29. Collected by R. S. Kirby. (Chupp)
Prior reports: *Connecticut, *Illinois, *Iowa, Minnesota, Missouri and *Nebraska.

MENTHA ARVENSIS (Field Mint)
+Rust caused by Puccinia menthae Pers.
New York - Tompkins County, August 11. (Chupp)

MENTHA SPP.
Rust caused by Puccinia menthae Pers.
+Florida - found very plentiful in the woods in the vicinity of Gainesville; an aecidial stage was found on the same plants as the telial stage, showing the cluster cups in abundance; the aecial cups developed about a month later than the telial stage and affected leaf blades, midrib and petiole. (Weber)
+Colorado - Ft. Collins, Larimer County, September. (Learn)

MENZIESIA FERRUGINEA (False Azalea)
Tar spot caused by Melasmia menziesiae Dearn. & Barth.
*+Oregon - resulted in little injury to host, Waldport, Lincoln County, October 9. (Boyce). Prior report: *Washington.

MONARDA FISTULOSA (Wild Bergamot)
Rust caused by Puccinia menthae Pers.
*+New York - Tompkins County, September 8. (Chupp)
Prior reports: *Colorado, *Illinois, *Indiana, *Iowa, *Kansas, *Michigan, Minnesota, *Mississippi, *Missouri, *Montana, *Nebraska, *North Dakota, *Ohio, *Pennsylvania, *South Dakota, *Texas, *Virginia, *Wisconsin and *Wyoming.

MUSA TEXTILIS NEI (Manila Hemp)
Wilt caused by Fusarium cubense EFS.
Recent literature:
Lee, H. A. and F. B. Serrano. Banana wilt of the Manila hemp plant. Phytopath. 13: 253-256. May 1923.

NABALUS ALBUS
Powdery mildew caused by Erysiphe cichoracearum DC.
New York - Tompkins County, July 8. (Chupp)
Rust caused by Puccinia prenanthis (Pers.) Lindr.
New York - Tompkins County, May 28. (Chupp)

Rust caused by Puccinia patruelis Arth.
Minnesota - (Sect. Pl. Path.)
Leafspot caused by Septoria nabali B. & C.
New York - Tompkins County, July 4. (Chupp)

NABALUS ALTISSIMUS
Rust caused by Puccinia orbicula Pk.
New York - Ithaca, Tompkins County, May 16. Collected by H. H. Whetzel. (Chupp)

OENOTHERA BIENNIS (Common Evening Primrose)
Powdery mildew caused by Erysiphe polygoni DC.
*+New York - general; Allegany County, August 14. (Chupp)
Prior reports: Alabama, *Idaho, Illinois, Iowa, Minnesota, Mississippi, *North Dakota and Ohio.
Downy mildew caused by Peronospora arthuri Farl.
*+New York - Cortland County, June 3. Collected by M. F. Barrus. (Dept. Pl. Path.)
Prior reports: *Idaho, *Illinois, Indiana, *Iowa, *Kansas, *Maryland, *Massachusetts, Mississippi, Missouri, *Nebraska and *Ohio.
Rust caused by Puccinia peckii (DeT.) Kell.
*+New York - Columbia County, June 16. (Chupp)
Minnesota - Beltrami, Aitkin and Chisago Counties. (Dept. Pl. Path.)
Prior reports: *California, *Iowa, Kansas, Minnesota, *Mississippi, *Nebraska and *Wisconsin.
Leafspot caused by Septoria oenotherae West
*+New York - Tompkins County, July 20. Collected by E. F. Guba. (Chupp)
Prior reports: Alabama, *District of Columbia, *Illinois, Indiana, *Iowa, *Kansas, *Kentucky, *Maryland, *Massachusetts, *Minnesota, *Mississippi, Nebraska, *North Carolina, *Ohio, Pennsylvania, South Carolina, *South Dakota and *Wisconsin.
+Rust caused by Uromyces plumbarius Pk.
New York - Columbia County, June 16. (Chupp)

OENOTHERA SP. (Tetraptera variety childsii)
+Powdery mildew caused by Erysiphe polygoni DC.
New York - Allegany County, August 14. (Chupp)

ONOCLEA SENSIBILIS (Sensitive Fern)
+Dodder - Cuscuta gronovii Willd.
New York - Onondaga County, September 15. (Chupp)
+Rust caused by Uredinopsis americana Syd.
New York - Oswego County, September 11. (Chupp)

OSMARONIA CERASIFORMIS (Indian Plum)
Leafspot caused by Septogloeum nuttallii Hark.
+Oregon - sometimes causes premature leaf fall; Rujada, Lane County, June 17; Macleay Park, Portland, Multnomah County, August 2. (Boyce). Prior report: *California.

OSMORRHIZA CLAYTONI (Woolly or Hairy Sweet-cicely)
Rust caused by Puccinia pimpinellae (Str.) Lk.
*New York - Tompkins County, May 14. Collected by E. E. Honey. (Chupp)
Prior reports: Illinois, Iowa and *Wisconsin.

OSMORRHIZA LONGISTYLIS (Washingtonia longistylis) (Smoother Sweet-Cicely, Anise-root)
Rust caused by Puccinia pimpinellae (Str.) Lk.
*+New York - Tompkins County, May 10. (Chupp)
Prior reports: Illinois, Indiana and Iowa.

OXALIS CORNICULATA (Creeping Oxalis)
Powdery mildew caused by Microsphaera russellii Clint.
+New York - Tompkins County, September 8. (Chupp)
Prior report: Indiana.
Leafspot caused by Phyllosticta guttulata Hals.
+New York - rare, Genessee County, August 22. (Chupp)
Prior reports: Indiana, *New Jersey and *Vermont.

PANAX SP. (Ginseng)
+Root rot caused by Ramularia sp.
Washington - (Heald & Dana)
Recent literature:
Nakata, Kakugoro and Seito Takimoto. Studies on ginseng diseases in Korea. Bul. Agr. Exp. Sta. Chosen 5: 81. 1922. The following new species are described (in English): Colletotrichum panacicola on leaf and stem; Bacterium panaxi, amber rot; Phoma panacis, brown, brown and silvery gray rot on stems; Phyllosticta panax, brown spot of leaves. English abstract in Japanese Jour. Bot. 1: 43-44. 1923.

PARNASSIA CAROLINIANA (Carolina Parnassia)
+Powdery mildew caused by Erysiphe polygoni DC.
New York - Tompkins County, August 11. (Chupp)

PELLAEA ATROPURPUREA
Rust caused by Hyalopsora cheilanthis Arth.
Kentucky - (McFarland)
Recent literature:
McFarland, F. T. The occurrence of two fern rusts in Kentucky. Science 58: 186. Sept. 1923.

PELTANDRA VIRGINICA (Virginia Arrow-Arum)
Rust caused by Uromyces ari-virginici (Schw.) Howe
+New York - Tompkins County, July 29. (Chupp)
Prior report: *Pennsylvania

PERSICARIA HYDROPIPER (Polygonum hydropiper) (Smart Weed)
Leafspot caused by Septoria polygonorum Desm.
+New York - Tompkins County, June 21. (Chupp)
Prior reports: Missouri and West Virginia.

PERSICARIA LAPATHIFOLIUM
Leafspot caused by Septoria polygonorum Desm.
New York - Tompkins County, June 21. (Chupp)

PERSICARIA MUHLENBERGII (Polygonum muhlenbergii) (Swamp Persicaria)
Rust caused by Puccinia polygoni amphibii Pers.

+New York - Ithaca, Tompkins County, September 6. Collected by R. S. Kirby. (Dept. Pl. Path.)
Prior reports: Idaho, Indiana, Michigan, Minnesota, Montana, South Dakota, Washington and Wyoming.

PERSICARIA PENNSYLVANICA
+Dodder - Cuscuta gronovii Willd.
New York - Orleans County, June 21. (Chupp)

PERSICARIA PERSICARIA (Polygonum persicaria) (Lady's Thumb, Heartweed)
+Powdery mildew caused by Erysiphe polygoni DC.
New York - statewide; Allegany County, August 15. (Chupp)

PHRAGMITES COMMUNIS (Tall Red Grass)
Rust caused by Puccinia phragmitis (Schum.) Kern
*Minnesota - Hennepin County. (Sect. Pl. Path.)
Prior reports: *Colorado, *Illinois, *Iowa, *Kansas, *Michigan, *Nebraska, *North Dakota, *South Dakota and *Wisconsin.

PHYSALIS SPP. (Ground Cherry)
+White smut caused by Entyloma australe Speg.
New York - appeared in garden in 1922; plants of 1923 were from new seed; fungus evidently stays in the soil. (Whetzel) Reported on +Physalis francheti, +P. pruinosa and +P. subglabrata, Tompkins County, July 19. (Chupp)

PHYTOLACCA AMERICANA (DECANDRA) (Common Poke-berry)
+Mosaic - cause undetermined
New York - Nassau County, June 10. (Chupp)

PHYTOLACCA SP. (Pokeweed, Pokeberry)
+Mosaic - cause undetermined
*New York - Mineola, Nassau County, June 10. Collected by W. D. Mills. (Dept. Pl. Path.)
Florida - found on the host plant practically everywhere in the state; the host is widely scattered and they were found to be 100% infected whether isolated in the thick woods or on the border of cultivated fields. (Weber)

PLANTAGO MAJOR (Common Plantain)
Powdery mildew caused by Erysiphe cichoracearum DC.
*+New York - statewide; Franklin County, July 28. (Chupp)
Prior reports: *Colorado, *District of Columbia, Indiana, Iowa, Minnesota, Missouri, *Montana, *Nebraska, *North Dakota and *Pennsylvania.
Downy mildew caused by Peronospora effusa (Grev.) Rabh.
*+New York - Wayne County, July 9. (Chupp). Prior report: Iowa.
Leafspot caused by Ramularia plantaginis Ell. & Mart.
+New York - Tompkins County, April 1. (Chupp)
Prior reports: *Illinois, *Indiana, Kentucky, *Maine, *Minnesota, *Nebraska, *New Jersey, *Ohio and *Wisconsin.

PLANTAGO RUGELII
Powdery mildew caused by Erysiphe cichoracearum DC.

+New York - statewide; Franklin County, July 28. (Chupp)
Prior reports: *Illinois, Iowa and *Nebraska.
Leafspot caused by Ramularia plantaginis Ell. & Mart.
+New York - Tompkins County, April 1. (Chupp)
Prior report: Indiana.

PLANTAGO SPP. (Plantain)
Leafspot caused by Cercospora plantaginis Sacc.
*+Missouri - killed entire plants; Sedalia, Pettis County, July 26. (Burrill)
Prior reports: *District of Columbia and *Kansas.

PODOPHYLLUM PELTATUM (Mandrake)
Leafspot caused by Phyllosticta podophylli (Curt.) Wint.
*+New York - Erie County, June 25. (Chupp)
Prior reports: Alabama, Delaware, *Illinois, Indiana, Kentucky, *Mississippi, Missouri, *Ohio and Pennsylvania.
Rust caused by Puccinia podophylli Schw.
*+New York - Tompkins County, May 8. (Chupp)
Prior reports: Alabama, *Delaware, *District of Columbia, *Illinois, *Indiana, *Iowa, *Kansas, *Louisiana, *Maryland, *Michigan, *Mississippi, *Missouri, *New Jersey, *Ohio, *Pennsylvania, *South Carolina, *Virginia, *West Virginia and *Wisconsin
Leafspot caused by Septoria podophyllina Pk.
*+New York - Chautauqua County, June 25. (Chupp)
Prior reports: Illinois, Indiana, Iowa, *Mississippi, *Ohio, *Pennsylvania and *West Virginia.

POLYGALA PAUCIFLORA (Fringed Polygala)
Rust caused by Puccinia polygalae Pazschke
New York - small colony of Polygala in Enfield Gorge, Tompkins County, affected July 8. (Chupp)
Prior reports: *Connecticut, *Michigan, *New Hampshire and *New York.

POLYGONUM AVICULARE (Knot Grass, Door Weed)
Powdery mildew caused by Erysiphe polygoni DC.
Minnesota - St. Louis and Hennepin Counties. (Sect. Pl. Path.)
Prior reports: *California, *Delaware, *District of Columbia, *Illinois, *Indiana, *Iowa, Minnesota, *Montana, *Nebraska, *New Mexico, *New York, *North Dakota, *Ohio, *Oregon, *South Dakota, *Texas, *Vermont, Virginia, *Washington, *Wisconsin and *Wyoming.
Rust caused by Puccinia polygoni Pers.
+New Jersey - New Brunswick, Middlesex County, August 28. (Dept. Pl. Path.) Prior report: New Jersey.
+Powdery mildew caused by Sphaerotheca sp.
New Jersey - New Brunswick, Middlesex County. (Dept. Pl. Path.)
Rust caused by Uromyces polygoni (Pers.) Fckl.
*+New York - Tompkins County, May 27. (Chupp)
Prior reports: *California, *Delaware, *Illinois, *Indiana *Iowa, *Kansas, *Maine, *Massachusetts, *Michigan, *Minnesota, *Mississippi, *Missouri, *Nebraska, *New Hampshire, *New Jersey, *North Dakota, *Pennsylvania, *Rhode Island, *South Dakota, *Utah, *Vermont, *Washington and *Wisconsin.

POLYGONUM ERECTUM (Erect Knotweed)
+Leafspot caused by Cercospora avicularis Wint.
Minnesota - Rice County. (Sect. Pl. Path.)
Powdery mildew caused by Erysiphe polygoni DC.
*+New York - Tompkins County, August 31. Collected by R. S. Kirby. (Dept. Pl. Path.)
Prior reports: *Colorado, *Idaho, *Illinois, *Indiana, Iowa, *Minnesota, North Dakota and *Ohio.

POLYGONUM HYDROPIPER - See Persicaria hydropiper

POLYGONUM LAPATHIFOLIUM - See Persicaria lapathifolia

POLYGONUM PENNSYLVANICUM - See Persicaria pennsylvanica

POLYGONUM PERSICARIA - See Persicaria persicaria

POLYGONUM SP.
Leafspot caused by Cercospora hydropiperis (Thuem.) Speg.
*+New York - Tompkins County, August 5. (Chupp)
Prior reports: *Illinois, *Indiana, *Missouri, *Nebraska, *New Jersey, *Ohio and *Virginia.
+Dodder - Cuscuta gronovii Willd.
*New York - Orleans County, June 27. (Chupp)
+Powdery mildew caused by Erysiphe sp.
Missouri - Sedalia, Pettis County. (Burrill)
Leafspot caused by Septoria polygonorum Desm.
New York - Tompkins County, June 21. (Chupp)
Prior report: *West Virginia.

PORTULACA OLERACEA
White rust caused by Albugo portulacae (DC.) Kuntze
*+New York - Genesee County, July 5. (Chupp)
Prior reports: Alabama, *District of Columbia, *Illinois, *Indiana, *Iowa, *Kansas, *Maryland, *Massachusetts, Minnesota, *Mississippi, Missouri, *Montana, *Nebraska, *New Jersey, *North Dakota, *Ohio, *South Carolina, *South Dakota and *Texas.

POTENTILLA CANADENSIS (Common Cinquefoil)
+Magnusiella potentillae (Farl.) Sadeb.
*New York - Tompkins County, July 1. Collected by M. F. Barrus. (Chupp)
+Rust caused by Phragmidium potentillae (Pers.) Karst.
*New York - Ithaca, Tompkins County, May 8. Collected by H. H. Whetzel. (Dept. Pl. Path.)

POTENTILLA FISSA
+Magnusiella potentillae (Farl.) Sadeb.
*Colorado - Boulder Falls, Boulder Canyon, Boulder, Boulder County, August 5. Collected by Guy West Wilson. (Jenkins)

POTENTILLA PALUSTRUS - See Comarum palustre

POTENTILLA SP.
Rust caused by Phragmidium potentillae (Pers.) Karst.
+New York - Tompkins County, May 6. (Chupp)

Prior reports: *Colorado, *Georgia, *Maine, *Maryland, Minnesota, *Montana, *Nebraska, *Nevada, *North Dakota, *South Dakota, *Vermont, *Washington and *Wyoming.
+Rust caused by Puccinia potentillae Pers.
*New York - Ulster County, May 17. Collected by M. F. Barrus. (Chupp)

PRENANTHES ALBA - See Nabalus albus

PRENANTHES ALTISSIMA - See Nabalus altissimus

PRIMULA POLYANTHA (Polyanthus Primrose)
+Leafspot caused by Ramularia primulae Thuem.
New York - in University Perennial Garden, Tompkins County, August 25. (Chupp)

PRUNELLA VULGARIS
Leafspot caused by Septoria prunellae Ell. & Holw.
+New York - Wyoming County, August 24. (Chupp)
Prior report: *Alabama.

PTERIDIUM AQUILINUM
Rust caused by Uredinopsis pteridis Diet. & Holw.
Kentucky - (McFarland)
Recent literature:
McFarland, F. T. The occurrence of two fern rusts in Kentucky. Science 58: 186. Sept. 1923.

RANUNCULUS ABORTIVUS (Small Flowered Crowfoot)
Powdery mildew caused by Erysiphe polygoni DC.
*+New York - statewide; Onondaga County, July 19. (Chupp)
Prior reports: *Illinois, *Indiana, Iowa, *Maryland, *Mississippi, *North Dakota and *Wisconsin.
+Downy mildew caused by Peronospora ficariae Tul.
New York - statewide; Tompkins County, May 5. (Chupp)

RANUNCULUS ACRIS (Tall Buttercup)
Powdery mildew caused by Erysiphe polygoni DC.
*+New York - Onondaga County, July 19; statewide. (Chupp)
Prior reports: *District of Columbia, *Massachusetts, *Michigan, Minnesota, *New Jersey and *Vermont.
Downy mildew caused by Peronospora ficariae Tul.
*+New York - Ithaca, Tompkins County, May 5. Collected by M. F. Barrus. (Dept. Pl. Path.). Prior report: *Massachusetts.

RANUNCULUS HISPIDUS (Bristly Buttercup)
+Downy mildew caused by Peronospora ficariae Tul.
New York - Ithaca, Tompkins County, May 17. Collected by H. H. Whetzel. (Dept. Pl. Path.)

RANUNCULUS RECURVATUS (Hooked Crowfoot)
Downy mildew caused by Peronospora ficariae Tul.
*+New York - Ithaca, Tompkins County, May 19. Collected by M. F. Barrus. (Dept. Pl. Path.) Prior report: Indiana.
Leafspot caused by Ramularia ranunculi Pk.
*+New York - Tompkins County, May 24. Collected by M. F. Barrus and E. E. Honey. (Chupp). Prior report: *Vermont.

RANUNCULUS SEPTENTRIONALIS (Swamp Buttercup)

+Rust caused by Puccinia clematidis (DC.) Lagerh.

New York - Cortland County, May 19. Collected by H. H. Whetzel. (Chupp)

RIBES AMERICANUM (American Black Currant)

Rust caused by Puccinia grossulariae (Schum.) Lagh.

New York - Tompkins County, May. (Chupp)

Prior reports: Connecticut, Indiana, *Nebraska, *New York, *North Dakota and *Wisconsin.

Powdery mildew caused by Sphaerotheca mors-uvae (Schw.) Berk. & Curt.

+Minnesota - Nicollet County. (Sect. Pl. Path.)

Prior reports: Iowa, Montana and North Dakota.

+Mosaic - cause unknown

New York - 50% in one field, Tompkins County, May 6. Collected by F. R. Perry. (Chupp)

RIBES LACUSTRE (Prickly Currant)

Rust caused by Puccinia parkerae Diet. & Holw.

+British Columbia - Daisy Lake, August 26. (Boyce)

Prior reports: *Oregon and *Washington.

RIBES SANGUINEUM (Red Flowering Currant)

Leafspot caused by Cercospora ribicola Ell. & Ev.

+Oregon - resulted in negligible injury; Rujada, Lane County, June 17. (Boyce). Prior report: *Washington.

RUBUS HISPIDUS (Swamp Dewberry)

+Orange rust caused by Gymnoconia interstitialis (Schl.) Lagh.

Connecticut - N. Branford, New Haven County, June 1. (Clinton)

Tar spot - cause undetermined

New York - Cortland County, May 19. Collected by H. H. Whetzel. (Chupp)

RUBUS PARVIFLORUS (Whiteflowering Raspberry) (Thimbleberry)

Rust caused by Phragmidium occidentale Arth.

*+Oregon - caused insignificant injury to the host; Waldport, Lincoln County, October 10. (Boyce)

Prior reports: Alaska, *California, *Colorado, *Idaho, Minnesota, *Montana, New Mexico, *Utah, *Washington, Wisconsin and Wyoming.

Leafspot caused by Septoria rubi West.

*+Oregon - resulted in negligible injury to the host; Macleay Park, Portland, Multnomah County, August 2; Waldport, Lincoln County, October 9. (Boyce)

Prior reports: *California, *Colorado, Idaho and *Washington.

RUBUS SP.

Rust caused by Gymnoconia interstitialis (Schl.) Lagh.

+New York - common all along the Hudson and Long Island; Ulster and Dutchess Counties. Collected by E. F. Guba May 1 (Guba)

Prior reports: Alabama, Arizona, Arkansas, Connecticut, Delaware, Florida, Iowa, Maine, Maryland, Massachusetts, Minnesota, Missouri, New Jersey, Tennessee, Texas, Virginia and Washington.

*+New York - creeping dewberry. (Dept. Pl. Path.)
*+New York - wild blackberry; Labrador Lake, Cortland County, June 3. Collected by M. F. Barrus. (Dept. Pl. Path.)

RUMEX ACETOSA (Green Sorrel) (Schaff)
+Leafspot caused by Gloeosporium rumicis Ell. & Ev.
New York - 10% reduction in yield for state; Nassau County, May 29. (Chupp)

RUMEX CRISPUS (Curled or Narrow Dock)
+Dodder - Cuscuta gronovii Willd.
New York - Cayuga County, September 15. Collected by E. E. Honey. (Chupp)
Leafspot caused by Ramularia sp.
New York - statewide; Monroe County, August 21. (Chupp)

RUMEX SPP.
+Mosaic - cause unknown
New York - probably statewide; very common and noticeable; both on broad and narrow leaf dock; Niagara County, June 3. (Chupp)

SAPONARIA OFFICINALIS (Bouncing Bet)
Leafspot caused by Macrosporium saponariae Pk.
*+New York - Tompkins County, June 16. (Chupp)
Prior reports: Connecticut, Indiana, *Maryland and Minnesota.

SATUREIA VULGARIS (Savory)
+Rust caused by Puccinia menthae Pers.
*New York - collected on Pine Knoll, Forest Home, Tompkins County, May 9. (Chupp)

SAXIFRAGA PENNSYLVANICA
Rust caused by Puccinia saxifragae Schl.
+New York - on 50% of plants in one gorge, Tompkins County, May 13. Collected by E. E. Honey. (Chupp)
Prior reports: Indiana and Minnesota.

SAXIFRAGA VIRGINIENSIS
Rust caused by Puccinia saxifragae Schl.
*+New York - on 50% of plants in one gorge, Tompkins County, May 13. Collected by M. F. Barrus. (Chupp)
Prior report: *District of Columbia.

SCABIOSA JAPONICA (Japanese Scabiosa)
+Stem canker caused by Sclerotinia sclerotiorum (Lib.) Mass.
New York - in University perennial garden; canker on main stem and lower lateral branches; Tompkins County, October 2. Collected by Honey and Whetzel. (Chupp)

SEDUM SP. (Stonecrop)
+Leafspot caused by Septoria sedi West.
New York - common on plants in floricultural plots; Tompkins County, September 6. Collected by E. F. Guba. (Chupp)

SICYOS ANGULATUS (One-Seeded Bur-Cucumber)
Downy mildew caused by Rhysotheca australis (Speg.) Wils.
+Missouri - collected at Columbia, Boone County. (Maneval)
Prior report: Indiana

SIDA SPINOSA (Prickly Sida)
Rust caused by Puccinia heterospora Berk. & Curt.
*+Mississippi - general; Oktibbeha County, September 15. (Neal & Barker). Prior reports: Alabama, Florida and Missouri.

SISYMBRIUM OFFICINALE (Hedge Mustard)
White rust caused by Albugo candida (Pers.) Kuntze
*+New York - Medina, Orleans County, July 11. (Chupp)
Prior reports; *Delaware, *Idaho, Indiana, *Iowa, Minnesota, *New Jersey, *Pennsylvania, *Washington and West Virginia.

SMILACINA RACEMOSA (False Solomonseal)
+Leafspot caused by Macrosporium sp.
New York - Monroe County, September 21. Collected by Kirby and Honey. (Chupp)
Leafspot caused by Phyllosticta convallariae Pers. (Phyllosticta cruenta Kickx.)
*+New York - very common, Tompkins County, July 4. (Chupp)
Prior reports: Alabama, *Connecticut, Idaho, Indiana, Iowa, *Maryland, *Massachusetts, New Jersey, Pennsylvania, *Virginia and Wisconsin.

SMILAX SP.
+Fly speck - cause undetermined
New York - Onondaga County, May 19. (Chupp)

SOLANUM DULCAMARA (Bitter Nightshade)
+Dodder - Cuscuta gronovii Willd.
New York - Genesee County, June 27. (Chupp)

SOLANUM SP. (Nightshade)
+Leafspot caused by Cercospora atro-marginalis Atk.
Florida - observed on the host in waste places; very destructive to the leaves but of no economic consequence. (Weber)

SOLIDAGO ALTISSIMA (Tall Goldenrod)
Rust caused by Coleosporium solidaginis Thuem.
+New York - statewide; Monroe County, May 30. (Chupp)
Prior report: Indiana.
+Dodder - Cuscuta gronovii Willd.
New York - Genesee County, June 27. (Chupp)
+Powdery mildew caused by Erysiphe cichoracearum DC.
New York - statewide; Tompkins County, August 18. (Chupp)
+Rust caused by Puccinia caricis-solidaginis Arth.
New York - statewide; Onondaga County, June 3. (Chupp)

SOLIDAGO CANADENSIS (Canada Goldenrod)
+Rust caused by Puccinia caricis-solidaginis Arth.
New York - statewide; Onondaga County, June 3. (Chupp)

SOLIDAGO JUNCEA (Sharptoothed Goldenrod)
+*Powdery mildew* caused by *Erysiphe cichoracearum* DC.
New York - statewide; Tompkins County, August 18. (Chupp)

SOLIDAGO LATIFOLIA (Broadleaf Goldenrod)
Rust caused by *Coleosporium solidaginis* Thuem.
+New York - probably statewide; Monroe County, May 30. (Chupp)
Prior reports: Illinois, Indiana, Iowa, Pennsylvania and Texas.
Powdery mildew caused by *Erysiphe cichoracearum* DC.
+New York - statewide; Tompkins County, August 18. (Chupp)
Prior report: Indiana.

SOLIDAGO PATULA (Roughleaf Goldenrod)
+*Rust* caused by *Puccinia caricis-solidaginis* Arth.
*New York - statewide; Onondaga County, June 3. Collected by M. F. Barrus. (Chupp)

SOLIDAGO RUGOSA (Wrinkled Goldenrod)
Rust caused by *Coleosporium solidaginis* Thuem.
+New York - probably statewide; Monroe County, May 30. (Chupp)
Prior reports: Alabama, Connecticut, *District of Columbia, Indiana, Maine, Vermont and West Virginia.
+*Rust* caused by *Puccinia caricis-solidaginis* Arth.
*New York - statewide, Onondaga County, June 3. (Chupp)
+*Leafspot* caused by *Septoria* sp.
New York - Onondaga County, June 3. Collected by M. F. Barrus. (Chupp)

SOLIDAGO SEMPERVIRENS (Seaside Goldenrod)
+*Rust* caused by *Puccinia caricis-solidaginis* Arth.
New York - statewide; Onondaga County, June 3. (Chupp)

SOLIDAGO SEROTINA (November Goldenrod)
+*Fly speck* - cause undetermined
New York - Taughannock Falls, Tompkins County, August 18. (Chupp)

SOLIDAGO SPP. (Goldenrod)
Rust caused by *Coleosporium solidaginis* Thuem.
+New York - statewide; Monroe County, May 30. (Chupp)
Prior reports: *Alabama, *Arkansas, *Colorado, *Delaware, *District of Columbia, *Illinois, *Indiana, *Iowa, *Kansas, *Kentucky, *Maine, *Maryland, *Massachusetts, *Michigan, *Minnesota, *Mississippi, *Missouri, *Montana, *Nebraska, *New Hampshire, *New Jersey, *New York, *North Carolina, *North Dakota, *Ohio, *Oklahoma, *Oregon, *Pennsylvania, *South Carolina, *South Dakota, *Tennessee, *Virginia, *Washington and *Wisconsin.
+*Dodder* - *Cuscuta gronovii* Willd.
New York - Genesee County, June 27. (Chupp)
Powdery mildew caused by *Erysiphe cichoracearum* DC.
+New York - statewide; Tompkins County, August 18. (Chupp)
Prior report: Montana.
+*Black knot* caused by *Montagnella heliopsidis* (Schw.) Sacc.
New York - common; Tompkins County, May 7. Collected by H. M. Fitzpatrick. (Chupp)
+*Leafspot* caused by *Rhytisma punctatum* (Pers.) Fr.
New Jersey - New Brunswick, Middlesex County, September. (Dept. Pl. Path.)

+Mosaic - cause undetermined
*New York - Nassau County, June 10. Collected by Mills and Whetzel. (Chupp)

STACHYS CILIATA (Hedge Nettle)
+Powdery mildew caused by Erysiphe galeopsidis DC.
Washington - Beaver, Clallam County, August 14. (Boyce)

STACHYS TENUIFOLIA (Smooth Hedge Nettle)
+Powdery mildew caused by Erysiphe galeopsidis DC.
New York - Onondaga County, September 15. Collected by E. E. Honey. (Chupp)
+Leafspot caused by Septoria stachydis Rob. & Desm.
New York - Tompkins County, September 11. Collected by Kirby and Honey. (Chupp)

STELLARIA MEDIA - See Alsine media

SYMPLOCARPUS FOETIDUS (Skunk Cabbage)
+Rot caused by Botrytis sp.
New York - Nassau County, June 9. (Chupp)

TARAXACUM DENS-LEONIS - See Taraxacum officinale

TARAXACUM ERYTHROSPERMUM (Dandelion)
+Rust caused by Puccinia taraxaci (Reb.) Plow.
*New York - collected by R. S. Kirby, September 9. (Dept. Pl. Path.)

TARAXACUM OFFICINALE (Common Dandelion)
Rust caused by Puccinia taraxaci (Reb.) Plow.
Prior reports: *Colorado, Connecticut, *Idaho, *Illinois, *Indiana, Iowa, *Kansas, *Kentucky, *Louisiana, *Maine, *Maryland, *Michigan, Minnesota, *Missouri, *Montana, *Nebraska, *New Jersey, *New York, *North Dakota, *Ohio, *Pennsylvania, *South Dakota, *Utah, *Vermont, *Washington, West Virginia, *Wisconsin and *Wyoming.
Leafspot caused by Ramularia lineola Pk.
*+New York - Orleans County, June 11. (Chupp)
Prior reports: Indiana and *North Dakota.
Leafspot caused by Ramularia taraxici Karst.
Minnesota - Waseca County. (Dept. Pl. Path.)
Prior reports: *Colorado, Connecticut, Idaho, *Illinois, Iowa, *Mississippi and *North Dakota.
Powdery mildew caused by Sphaerotheca castagnei Lev.
+Connecticut - Storrs, Eagleville County, August 3. (Clinton)
Prior reports: Illinois, Missouri, New York and North Dakota.
Powdery mildew caused by Sphaerotheca humuli (DC.) Burr.
*+New York - statewide; Tompkins County, July 2. (Chupp)
Prior reports: Connecticut, Idaho, *Illinois, *Indiana, Iowa, *Kansas, *Massachusetts, Minnesota, *Missouri, *North Dakota, Ohio and Washington.
Stem and leaf nematode caused by Tylenchus dipsaci (Kuehn) Bast.
Report by G. H. Godfrey, July 24, 1923
"During the course of the Fifth Annual Field Meeting of Phytopathologists, held July 9-12, in western New York,

the stem nematode (Tylenchus dipsaci) was found in some abundance infesting the dandelion, Taraxacum officinale.

"The symptoms were typical of those produced by the same organism on other hosts, -- a thickening and crinkling of the leaf in spots, or, in the severer cases in large regions, resulting in marked distortion. Usually a spot could be discerned by its lighter green color, but the very characteristic finely netted crinkling is the distinguishing feature. This is most readily seen as a rule on the lower leaf surface. Often a midrib or one of the branch veins is attacked and shows a swelling and a distortion of the leaf at this point. Sometimes the mesophyll tissue alone is attacked.

"This finding is not especially significant in itself, but indicates the possible occurrence on other hosts, and a possible gradual adaptation which may result in a real problem in American agriculture.

"This constitutes the first finding of Tylenchus dipsaci in the Northeast, aside from its occasional occurrence in Narcissus bulbs imported from Europe. It was found to be widespread. Infected plants were found at Ithaca, Williamson, Medina and Rochester, New York, and even at Vineland and other points in the Province of Ontario, Canada. It was not found on a brief survey in a park in North Philadelphia or at Washington, D. C."

THALICTRUM POLYGAMUM (Tall Meadow Rue)
Rust caused by Puccinia thalictri Chev.
*+New York - Onondaga County, June 30. Collected by H. H. Whetzel. (Dept. Pl. Path.)
Prior reports: *Massachusetts, *New Hampshire and *Pennsylvania.

TINIARIA CONVOLVULUS (Corn Bindweed)
Rust caused by Puccinia polygoni-amphibii Pers.
*+New York - Tompkins County, August 11. (Chupp)
Prior reports: Indiana and Minnesota.

TINIARIA SCANDENS (Climbing False Buckwheat)
Downy mildew caused by Peronospora polygoni Thuem.
+New York - Tompkins County, June 23. (Chupp)
Prior report: Iowa.
Rust caused by Puccinia polygoni-amphibii Pers.
New York - Tompkins County, August 11. (Chupp)
Prior report: *Illinois.

TRIADENUM VIRGINICUM (March St. Johnswort)
+Rust caused by Uromyces hyperice-frondosi (Schw.) Arth.
*New York - Sag Harbor, Suffolk County, June 21. Collected by M. F. Barrus. (Dept. Pl. Path.)

TRIFOLIUM HYBRIDUM 2047
+Leafspot caused by Cercospora zebrina Pass.
*Indiana - Lafayette, Tippecanoe County, September 4. Collected by E. B. Mains. (Mains)

TRILLIUM GRANDIFLORUM (Snow Trillium)
+Rust caused by Aecidium trillii Burr.
New York - Tompkins County, May 24. (Chupp)

URTICA DIOICA (Stinging Nettle)
+Rust caused by Puccinia urticae (Schum.) Lagh.
Minnesota - Waseca County. (Dept. Pl. Path.)

URTICASTRUM DIVARICATUM (Wood Nettle (Laportea canadensis)
+Dodder - Cuscuta gronovii Willd.
New York - Onondaga County, September 15. (Chupp)
+Powdery mildew caused by Erysiphe cichoracearum DC.
New York - Monroe County, September 22. (Chupp)

VACCINIUM CANADENSE (Canada Blueberry)
Rust caused by Calyptospora columnaris (Alb. & Schw.) Kuhn.
+Minnesota - Itasca County. (Sect. Pl. Path.)
Prior reports: California, Colorado, Idaho, Maine, Massachusetts, Vermont and Washington.

VACCINIUM OVATUM (Huckleberry, Evergreen)
+Leaf rust caused by Pucciniastrum myrtilli (Schum.) Arth.
British Columbia - not common, Daisy Lake, August 22. (Boyce)

VACCINIUM PENNSYLVANICUM
Rust caused by Calyptospora columnaris (Alb. & Schw.) Kuhn.
+Minnesota - Itasca County. (Sect. Pl. Path.)
Prior reports: Maine and Massachusetts.

VACCINIUM VITISIDAEA (Cowberry)
Leafspot caused by Exobasidium vaccinii (Fckl.) Wor.
*+New York - Nassau County, June 9. Collected by W. D. Mills. (Dept. Pl. Path.). Prior report: Alaska.

VERATRUM VIRIDE (American False Hellebore)
Rust caused by Puccinia veratri Niessl.
*+New York - Tompkins County, August 1[illegible]. Collected by E. E. Honey. (Chupp)
Prior reports: *California, *New Hampshire and *West Virginia.

VERBASCUM BLATTARIA (Moth Mullen)
Leafspot caused by Septoria verbascicola Berk. & Curt.
*+New York - Niagara County, June 26. Collected by E. E. Honey. (Chupp)
Prior reports: Alabama, Indiana, *Kentucky, *New Jersey, *Ohio and *Pennsylvania

VERBENA SP. (Vervain)
Powdery mildew caused by Erysiphe cichoracearum DC.
*+New York - Onondaga County, September 3. Collected by K. H. Fernow. (Dept. Pl. Path.)
Prior reports: *Alabama, *District of Columbia, *Illinois, *Louisiana, *Minnesota, Mississippi, *New Mexico, *Texas and *Wisconsin.

VIOLA CANADENSIS (Canada Violet)
Rust caused by Puccinia violae (Schum.) DC.
*+New York - Highland, Ulster County, May 17. Collected by M. F. Barrus. (Dept. Pl. Path.)
Prior reports: Indiana and North Dakota.

VIOLA PUBESCENS (Downy Yellow Violet)
Rust caused by Puccinia violae (Schum.) DC.
*+Iowa - Montour, Tama County, May 30. Collected by H. S. Conard. (Dept. Pl. Path.). Prior report: Indiana.

VIOLA STRIATA (Cream Violet)
Rust caused by Puccinia violae (Schum.) DC.
*+New York - Ithaca, Tompkins County, May 20. Collected by M. F. Barrus. (Dept. Pl. Path.). Prior report: Indiana.

VITIS CORDIFOLIA (Frost Grape)
Downy mildew caused by Plasmopara viticola (Berk. & Curt.) Berl. & deT.
*+New York - Ithaca, Tompkins County, July 1. Collected by M. F. Barrus. (Dept. Pl. Path.)
Prior reports: *Indiana, *Maryland, *Missouri and *Ohio.

VITIS SP. (Wild Grape)
+Leafspot caused by Macrophoma sp.
New York - Tompkins County, September 8. (Chupp)

WALDSTEINIA FRAGARIOIDES (Barren Strawberry)
+Rust caused by Puccinia waldsteiniae Curt.
New York - Tompkins County, July 4. (Chupp)
Leafspot caused by Septoria waldsteiniae Pk. & Cke.
New York - Tompkins County, October 5. Collected by R. S. Kirby. (Chupp)

XANTHIUM COMMUNE
Rust caused by Puccinia xanthii Schw.
*Minnesota - Heron Lake, Jackson County, July 25. Collected by H. S. Conard. (Dept. Pl. Path.). Prior report: Indiana.

XANTHIUM ORIENTALE (Cocklebur)
Rust caused by Puccinia xanthii Schw.
*+New York - Tompkins County, May 24. (Chupp)
Oklahoma - Payne County, September 18. (Stratton)
+Colorado - Ft. Collins, Larimer County, July. (Learn)
+New Jersey - Medford, Burlington County, September 5. (Dept. Pl. Path.)
Prior reports: Alabama, Indiana, Mississippi, North Dakota and *Oklahoma.

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Prepared by Mary G. Van Meter

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ERRATA AND EXPLANATION

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7 Read "Sclerotium cepivorum" instead of "Sclerotinia cepivorum".

11 Read "Bacterium campestre" instead of "B. campestra".

15 Read "Sclerotium cepivorum" instead of "S. cepovorum".

91, 109, 139, 142, and 386 Read "Septobasidium pedicellatum" instead of "pedicillatum".

109 Read "Septobasidium pseudopedicellatum" instead of "S. pseudopedicillatum".

116 Read "Sphaceloma" instead of "Sphacetoma".

127 and 130 Read "Acrostalagmus" instead of "Acrostolagmus".

139 Read "Tylenchus" instead of "Tylenchulus".

141 Read "Heterodera radicicola" instead of "H. radiciola".

177 Read "Heterodera radioicola" instead of "H. radicicila".

191 Read "Fusarium cepa" instead of "F. cepae".

213 Read "Sclerotinia libertiana" instead of "S. libertiniana".

221 Read "Ascochyta" instead of "Asochyta".

233 Read "Phytophthora nicotianae" instead of "P. nicotiana".

246 Read "Bacterium coronafaciens atropurpureum" instead of "B. coronafaciens atropupureum".

310 Read "Sclerotium rolfsii" instead of "S. rolsfii".

315 Read "Ustilago longissima" instead of "U. longissma".

335 Read "Bacterium solanacearum" instead of "Bacillus solanacearum".

350 Read "Juniperus" instead of "Puniperus".

370 Read "Fusarium cinnabarinum" instead of "F. cinnabarium".

371 Read "Pholiota adiposa" instead of "P. adoposa".

386 Read "Exobasidium azaleae" instead of "E. azalea".

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388 Read "Macrophoma candollei" instead of "Macrosphoma".

393 Read "Oidium euonymi-japonici" instead of "O. euonymi-japonica".

404 Read "Rhododendron arborescens" instead of "R. arborescans".

405 Read "Rhododendron carolinianum" instead of "R. carolianum".

406 Read "Actinonema" instead of "Actinomena".

415 Read "Viburnum" instead of "Vibernum".

417 Read "Cercospora atricincta" instead of "C. atricinota".

418 Read "Cystopus bliti" instead of "C. blite".

Read "Amaranthus" instead of "Amarathus".

421 Read "Ramularia" instead of "Ramularis".

422 Read "Sphaerotheca humuli var. fuliginea" instead of ". humuli var. filiginea".

423 Read "Melanogramma" instead of Melamogramma".

424 Read "Phyllachora" instead of "Phyllochora".

Read "Erysiphe galeopsidis" instead of "E. galcopsidis".

425 Read "Comandra" instead of "Commandra".

433 Read "Uredinopsis" instead of "Urediniopsis".

437 Read "Magnusiella" instead of "Magnesiella".